FINDING OF NO SIGNIFICANT IMPACT

U.S. ARMY RESEARCH INSTITUTE OF ENVIRONMENTAL MEDICINE ENVIRONMENTAL ASSESSMENT

PROPOSED ACTION: The proposed action (Alternative I) of this Environmental Assessment (EA) is the continuation of the Army Operational Medicine research activities currently conducted at the U.S. Army Research Institute of Environmental Medicine (USARIEM) in Natick, Massachusetts. The research efforts at USARIEM are directed toward the development of protective and therapeutic material and doctrinal solutions to maximize the health and performance of military personnel in a variety of environmental climates.

ALTERNATIVES CONSIDERED: During the preparation of this EA, two alternatives to the proposed action were identified. The alternatives identified include moving USARIEM research activities to another location (Alternative II), and cessation of USARIEM operations (Alternative III, No Action). The proposed action and alternatives were analyzed relative to the needs of national defense and the probable and possible environmental and human health impacts of their implementation.

ENVIRONMENTAL CONSEQUENCES AND MITIGATION MEASURES: Significant adverse environmental or human health impacts are unlikely to result from implementation of the proposed action. Research activities have been conducted at USARIEM since the Institute was created in 1961. The potential impacts associated with the proposed action are anticipated to be minor, and to date, all observed impacts at this site have been insignificant. Potential risks to the USARIEM workforce, the local community, and the environment will continue to be mitigated by the application of required work practices and engineering controls for the safe handling, use, and disposal of hazardous materials. Adherence to health, environmental, and safety regulations will minimize potential risks to workers and the general public. Implementation of the proposed action will support the mission of USAMRMC and the needs of national defense.

FACTORS CONSIDERED IN THE FINDING OF NO SIGNIFICANT IMPACT: The EA systematically analyzes the proposed action and associated risks and issues. Particular attention is given to protection of the workforce, the local community, and the surrounding environment. The proposed action and the alternatives are analyzed with regard to national defense, specifically, the ability to mitigate future potential impacts to soldier health and performance resulting from military operations in environmental extremes.

CONCLUSIONS: The principal conclusions of this EA are (1) risks to the environment and human health and safety associated with the continued operation of USARIEM in its present scope and location (Alternative I) are extremely small; (2) the research activities conducted at USARIEM will result in important benefits to the United States by protecting soldiers and sustaining their fighting ability on the battlefield; and (3) implementation of the proposed action (Alternative I) will not result in significant adverse environmental or human health impacts. Moving these research activities to another location (Alternative II) or ceasing operations at USARIEM (Alternative III, No Action) will not significantly alter the environmental or human health impacts and will not adequately address the needs of national defense.

FOR THE COMMANDER

CLAUDIA BARTZ
Colonel, Army Nurse Corps
Deputy Chief of Staff for Regulatory Compliance and Quality
U.S. Army Medical Research and Materiel Command

Comments on this Finding of No Significant Impact may be directed to COMMANDER, USAMRMC, ATTN: MCMR-PA (Charles Dasey), Fort Detrick, MD 21702-5012 and must be received by August 12, 1998. Copies of the EA are available at the Bacon Free Library, 58 Elliot Street (Route 16), South Natick, MA 01760-5596 and the Morse Institute Library, 14 East Central Street, Natick, MA 01760-4630 and at http://MRMC-www.army.mil. Copies may also be obtained by writing to COMMANDER, USAMRMC, ATTN: MCMR-RCQ-E (Dr. Robert J. Carton), Fort Detrick, MD 21702-5012.

U.S. ARMY RESEARCH INSTITUTE OF ENVIRONMENTAL MEDICINE

ENVIRONMENTAL ASSESSMENT

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EXECUTIVE SUMMARY

The proposed action (Alternative I) of this Environmental Assessment (EA) is the continuation of the Army Operational Medicine research activities currently conducted at the U.S. Army Research Institute of Environmental Medicine (USARIEM) in Natick, Massachusetts. The research efforts at USARIEM are geared toward the development of protective and therapeutic material and doctrinal solutions to maximize the health and performance of individual military personnel in a variety of environmental climates.

Two alternatives to the proposed action have been identified: (1) relocation of USARIEM research activities to another location (Alternative II); and (2) cessation of USARIEM operations (Alternative III, No Action). The proposed action and alternatives considered were analyzed relative to the needs of national defense and the probable and possible environmental impacts of their implementation, including impacts to human health.

This EA was prepared in accordance with guidance provided in Army Regulation (AR) 200-2, *Environmental Effects of Army Actions*, dated December 23, 1988, implementing the *National Environmental Policy Act* (NEPA) (42 U.S. Code [USC] 4321-4347). This EA, *U.S. Army Research Institute of Environmental Medicine Environmental Assessment*, was researched and prepared by BSA Environmental Services, Inc. under subcontract to Science Applications International Corporation (SAIC), for the U.S. Army Medical Research and Materiel Command (USAMRMC) under Government Contract Number DAMD17-93-C-3141.

The principal conclusions of this EA are: (1) risks to the environment and human health and safety associated with the continued operation of USARIEM in its present scope and location (Alternative I) are extremely small, (2) the research activities conducted at USARIEM will result in important benefits to the United States by protecting soldiers and sustaining their fighting ability on the battlefield, and (3) implementation of the proposed action (Alternative I) will not result in significant adverse environmental or human health impacts. Although implementation of Alternative II (Relocation of USARIEM Research Activities) or Alternative III (Cessation of USARIEM Research Activities, No Action) is not likely to cause significant adverse environmental or human health impacts, neither alternative adequately addresses the needs of national defense.

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1.0 PURPOSE AND NEED FOR THE PROPOSED ACTION

The proposed action and subject of this EA is the continued conduct of research activities at U.S. Army Research Institute of Environmental Medicine (USARIEM) in Natick, Massachusetts, which is a key component of the U.S. Army Medical Research and Materiel Command (USAMRMC) Army Operational Medicine Research Program. USAMRMC is a major subordinate command of the U.S. Army Medical Command (MEDCOM). The USAMRMC mission is to protect the health and safety of military personnel and to develop medical materiel and procedures to treat injured personnel and hasten their return to duty. Six subordinate research and development laboratories and institutes assist USAMRMC in meeting its mission. The USAMRMC research and development program is divided into four research areas: Military Infectious Disease, Combat Casualty Care, Army Operational Medicine, and Medical Chemical/Biological Defense.

The purpose of the Army Operational Medicine Research Program is to provide U.S. military personnel with a full range of physical and mental capabilities to withstand the stress of heat, cold, fatigue, and psychological factors, in addition to the threat of weapons and uncertainty during wartime. On the battlefield, the soldier may be presented with a variety of environmental and occupational stresses in addition to the conventional weapons of battle. Specific research activities conducted at USARIEM include the development of protective and therapeutic material and doctrinal solutions to maximize the health and performance of individual military personnel, crews, and troop populations. In 1961, USARIEM was designated as a research laboratory under the U.S. Army Medical Research and Development Command (USAMRDC), which is now known as USAMRMC. In addition to USARIEM, the Walter Reed Army Institute of Research (WRAIR) and the U.S. Army Aeromedical Research Laboratory (USAARL) also conduct research activities in support of the USAMRMC Army Operational Medicine Program.

This EA describes the potential adverse environmental impacts, including human health impacts, associated with implementation of the proposed action and two alternatives to the proposed action. It also characterizes the environment that is potentially affected by the proposed action. It considers impacts that are expected to result from continued operation of the research activities conducted at USARIEM in their present size and scope, including adverse environmental and human health impacts, cumulative impacts that might occur after several years and/or in conjunction with impacts associated with other activities in the area, and as a result of an accident or incident.

Pursuant to NEPA (42 USC 4321-4347), each federal agency must give appropriate consideration to the potential environmental impacts associated with its proposed major actions. The Council on Environmental Quality (CEQ), Executive Office of the President, has promulgated regulations implementing NEPA (40 Code of Federal Regulations [CFR] Parts 1500-1508). AR 200-2, *Environmental Effects of Army Actions*, dated December 23, 1988 (32 CFR 651), is the Department of the Army (DA) implementation of NEPA and the CEQ regulations. This EA was prepared in accordance with AR 200-2 and CEQ regulations.

2.0 DESCRIPTION OF THE PROPOSED ACTION

2.1 Introduction

The proposed action described here is the continued conduct of the Army Operational Medicine research activities at USARIEM in Natick, Massachusetts. For the purpose of these research activities, the soldier is viewed as a medical/biological system with limitations, tolerances, and capabilities. During battle, the soldier may be faced with a full range of environmental and occupational stresses in addition to the conventional weapons of battle. The goal of the Army Operational Medicine Research Program is to identify, characterize, and prioritize the challenges soldiers may face on the battlefield and to seek mitigative measures that protect the soldier and sustain fighting ability.

2.2 Mission and Organization of USARIEM

The mission of USARIEM is to conduct basic and applied research to determine how environmental and occupational stresses affect the health and performance of soldiers. Conditions that may affect military personnel include exposure to environmental extremes (e.g., extreme heat, severe cold, and high terrestrial altitude); occupational tasks; physical training; nutrition; deployment operations; work intensity, duration, and type; and environmental contaminants. The purpose of the research conducted at USARIEM is to develop protective and therapeutic material and doctrinal solutions to maximize the health and performance of military personnel, crews, and troop populations.

USARIEM is organized with the Office of the Commander, Military Detachment, four research divisions, one technical support division, and a provisional research center (see Figure 2-1). The four research divisions are: the Biophysics and Biomedical Modeling Division, the Military Nutrition and Biochemistry Division, the Military Performance Division, and the Thermal and Mountain Medicine Division. The Research Support Division provides technical support to USARIEM. Included in this division is the Bioengineering Branch, the Information Management Branch, the Logistics Branch, the Operations Branch, the Resources Management Branch, Civilian Personnel, and the Central Laboratory. USARIEM currently employs 71 full-time and 10 part-time employees (Durkot, 1997a).

The U.S. Army Center for Environmental Health Research is a provisional detachment of USARIEM. The research center is located at Fort Detrick in Frederick, Maryland. The primary focus of this organization is environmental contamination research in support of Department of Defense (DoD) efforts to protect soldiers and for installation restoration purposes.

2.3 Location and Facilities

The USARIEM is a tenant of the U.S. Army Soldier Systems Command (SSCOM) Installation located in Natick, Massachusetts. Natick is situated approximately 20 miles west of Boston, Massachusetts (see Figure 2-2). USARIEM occupies Building 42 on the Installation (see Figure 2-3). USARIEM maintains an annually reviewed intra-service support agreement with SSCOM for utilities and services on a reimbursable basis. The majority of USARIEM activities are conducted within Building 42 or at approved off-site locations. Unique USARIEM research facilities located in Building 42 include altitude chambers, environmental chambers, physical

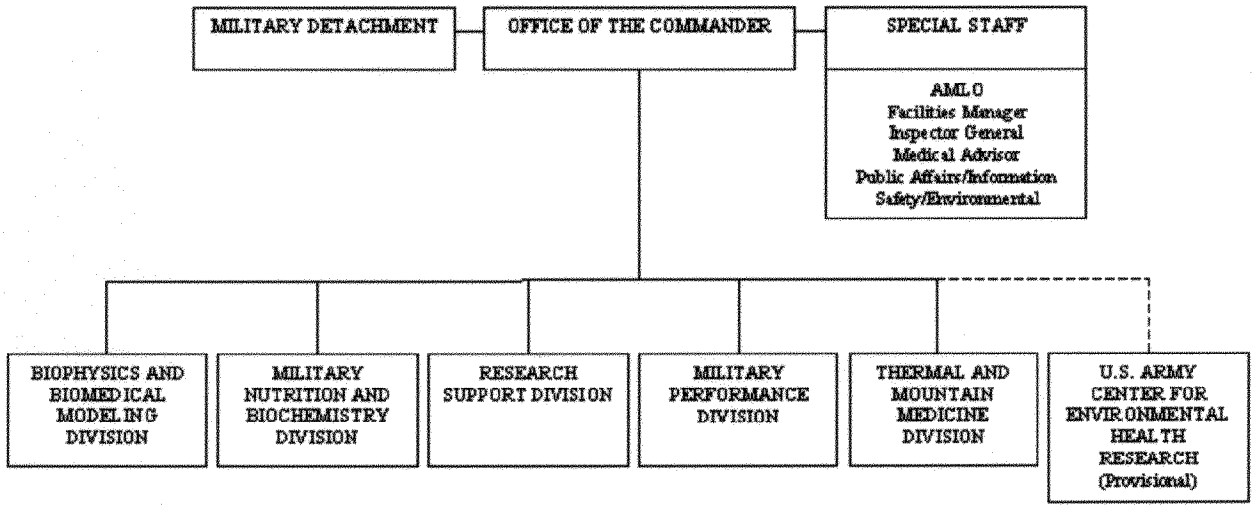

Figure 2-1 USARIEM Organizational Chart

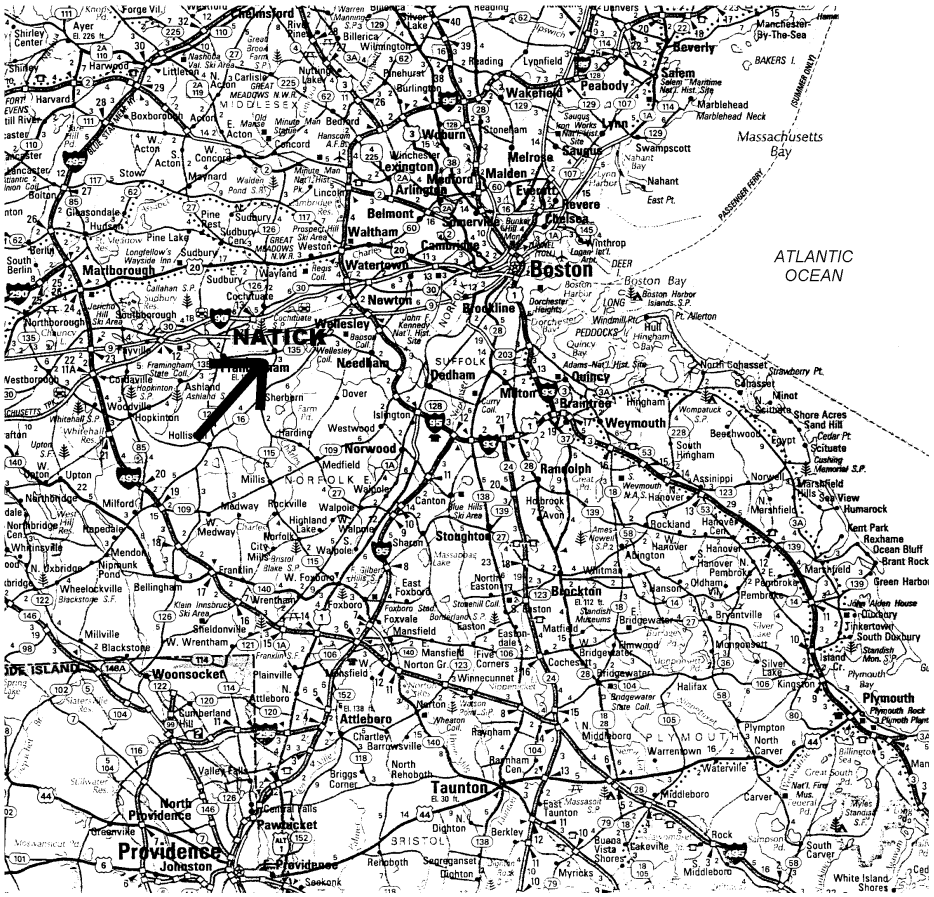

Figure 2-2 Location of Natick, Massachusetts

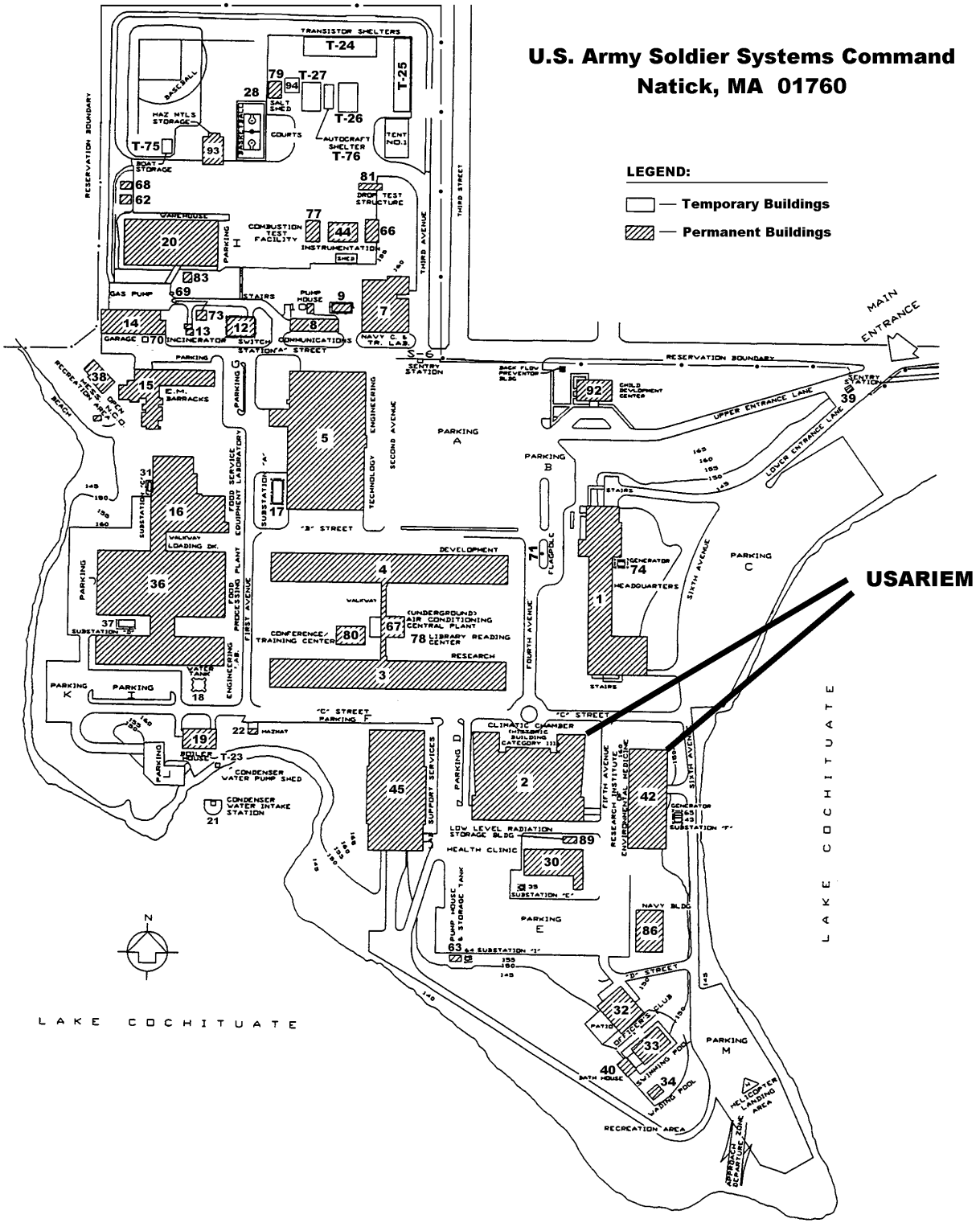

Figure 2-3 Location of USARIEM on SSCOM

performance laboratory, biomechanics laboratory, psychology laboratory, water immersion laboratory, human physiology laboratory, and electron microscopy laboratory. USARIEM investigators also utilize the Doriot Climatic Chambers located in Building 2 on the SSCOM Installation. In addition, USARIEM operates a research facility at Pikes Peak, Colorado.

The USARIEM Altitude Chamber, located in the basement of Building 42, can duplicate any mountainous environment in the world. The Altitude Chamber is composed of two interconnected and relatively independent chambers that can support human volunteers, research animals, or equipment in an environment where atmospheric pressure can be regulated. Researchers are able to perform sophisticated biomedical investigations on research subjects in the Altitude Chamber that are not possible in field environments. The facility can also duplicate the harsh environments found in enclosed, confined spaces such as those found in armored vehicles and submarines (USARIEM, 1997a). The 13 environmental chambers located in the basement of Building 42 allow researchers to conduct experiments under controlled temperatures from -40°F to 140°F, relative humidities ranging from 20% to more than 95%, and hypoxic (lacking oxygen) altitude equivalents up to 30,000 feet (USAMRMC, 1996).

The USARIEM laboratories offer a wide range of platforms for investigators to conduct research. For example, the psychology laboratory contains unique facilities, including the Weaponeer Rifle Marksmanship Simulator, the Noptel Marksmanship Trainer, the Pathfinder Evoked Potential Signal Averager, and the ASL Eye-Head Visual Tracking System. Another example is the water immersion laboratory that allows investigators to examine the effects on human volunteers submersed for varying lengths of time executing a variety of tasks. Equipment at the immersion laboratory enables researchers to examine the health of the individual (e.g., draw blood) during an experiment.

The Doriot Climatic Chamber Complex is a state-of-the-art SSCOM research facility located in Building 2 on the Installation. As a result of recent $20 million renovations, these chambers are now among the largest and most sophisticated environmental test chambers in the world. The complex consists of two wind tunnels, the Tropical Chamber and the Arctic Chamber. The wind tunnels are 60 feet long, 11 feet high, and 15 feet wide; they can generate wind speeds up to 40 miles per hour (mph). The temperature ranges for the Tropical Chamber and the Arctic Chamber are 0°F to 165°F and -70°F to 120°F, respectively. Other climatic variables in the chambers include rainfall up to 4 inches per hour and relative humidity ranges from 10% to 90%. The chambers are large enough to accommodate testing of 25 human volunteers, parachutes, armored tanks, test shelters, or other Army equipment (USARIEM, 1997a).

Equipment located at USARIEM includes a fully articulated, walking, and running copper manikin and a Hohenstein Skin Model. The copper manikin was developed by USARIEM to test various clothing systems. The hollow interior of the copper manikin contains three electrical components that deliver and regulate heat to the copper surface of the manikin. Movement of the manikin, skin temperature, and wetting of the manikin's skin are controlled automatically by a computer system. The Hohenstein Skin Model is a cotton skin used to cover and simulate sweat on the manikin. The skin is also used to measure the extent to which a particular clothing system interferes with evaporative cooling. The Hohenstein Skin Model located at USARIEM is the only device of its kind in the United States. These devices are utilized by USARIEM researchers to conduct evaluations of thermal and water vapor resistance of clothing and textiles (USAMRMC, 1996).

The Pikes Peak Research Facility is located at 14,104 feet above sea level on the top of Pikes Peak, Colorado. The facility enables USARIEM researchers to examine the effects of activities conducted at a high terrestrial altitude on human volunteers in the field. The Pikes Peak facility is utilized on a seasonal basis for planned and approved research projects.

2.4 Activities and Operations

This EA examines all activities and operations conducted by USARIEM at SSCOM in Natick, Massachusetts. Research activities conducted at USARIEM involve the use of hazardous chemicals, toxins, radionuclides, laboratory animals, and human subjects. Activities conducted by USARIEM at sites off-post must undergo the proper environmental review prior to initiation. AR 200-2 provides the guideline for assessing potential environmental impacts that may result from USARIEM research protocols. To date (past several years), the EAs for all USARIEM research protocols conducted both on- and off-site have resulted in Records of Environmental Consideration (REC) in accordance with either Categorical Exclusion A-11 or A-12 as defined in AR 200-2 (Durkot, 1997a). The SSCOM Environmental, Safety, and Health Office (ESHO) approves all USARIEM RECs.

In addition to Army Operational Medicine Program research activities, USARIEM provides assistance to the U.S. Army Natick Research, Development, and Engineering Center (NRDEC) by assessing the physiological effects of rations, clothing, boots, chemical defense protective gear, and other types of equipment under extreme climatic conditions. USARIEM researchers can also aid Army commanders and activities through technical, advisory, and consultant services (USAMRMC, 1996).

2.4.1 Thermal and Mountain Medicine Division

The Thermal and Mountain Medicine Division performs research on the effects of biomedical and mission factors on soldiers under various climatic conditions. These singular and interactive effects influence soldier work performance and tolerance to climatic stress. Health, nutritional status, age, gender, race, body size, acclimation rate, hydration level, and sleep status constitute the biomedical factors of a soldier. Mission factors include metabolic rate; work type, intensity, and duration; clothing; equipment; and medication. The objective of the research conducted under the Thermal and Mountain Medicine Division is to extend work capabilities and to minimize medical problems that result from executing military operations at extreme climatic conditions (e.g., extreme heat, severe cold) and at high terrestrial altitude. Research conducted focuses on reducing the incidence of climatic injuries and illnesses; utilizing acclimation, training, and biological intervention to characterize and enhance climatic tolerance and physical work capabilities; supporting the development of military clothing, boots, equipment, rations, and pharmaceutical products; defining mechanisms and systemic issues; and providing data and validation of mathematical models. These mathematical models are designed to predict nutrition and fluid needs, clothing requirements, tolerance to climatic stress, work capabilities, and susceptibility of soldiers to climatic injury. Improved doctrine, equipment, clothing, food, and medical products are produced as a result of this research (USARIEM, 1997a).

Investigators at the Thermal and Mountain Medicine Division of USARIEM utilize state-of-the-art physiological, biochemical, immunological, and biophysical techniques to execute research projects. Researchers conduct studies in the Altitude Chamber and the Doriot Climatic Chambers located at USARIEM and at the Pikes Peak Research Facility in Colorado. The USARIEM Altitude Chamber enables investigators to subject human volunteers or research

animals to simulated high terrestrial elevations for a period of hours to days. Researchers are then able to examine the medical and physiological problems encountered by military personnel during acute and short-term exposures to the climatic conditions associated with any mountainous environment. USARIEM researchers conduct physical performance and physiological experiments using two five-person treadmills and other equipment in the Doriot Climatic Chambers to determine the effects of ambient heat or cold on soldiers. The chambers can simulate a variety of climates ranging from arctic to tropical conditions. USARIEM research projects conducted in the Doriot Climatic Chamber Complex have contributed to critical operational guidance used by field commanders in Rwanda, Somalia, Haiti, Operation Desert Shield/Desert Storm, and the former Republic of Yugoslavia (USARIEM, 1997b).

2.4.2 Military Performance Division

One objective of the research conducted under the Military Performance Division of USARIEM is to enhance the performance of military tasks. Military performance includes the physical, cognitive, behavioral, and psychomotor performance of soldiers. A second objective of the research is to prevent decreased military performance resulting from nutritional deprivation, environmental and operational stresses, physical overload, and musculoskeletal injuries. Investigators in the Military Performance Division develop strategies and techniques to reduce training-related injuries, to establish medical criteria to optimize efficiency and ensure safety of individual solider equipment, and to prevent reduced physical capacity of soldiers caused by overtraining. Research conducted by this division results in improved individual selection and modified training strategies, tasks, operational procedures, and tactical doctrine, which optimize military performance (USARIEM, 1997a).

2.4.3 Biophysics and Biomedical Modeling Division

The Biophysics and Biomedical Modeling Division conducts research for the development and analysis of modeling simulation programs, thermal evaluations, and advanced biophysical response models that accurately portray soldiers, their clothing, and their equipment during the execution of training and mission exercises in a wide range of global environments. The primary research objectives of this division are: (1) the utilization of biophysical techniques to assess the impacts of protective clothing, handwear, footwear, and high-technology fiber material necessary for military operations in environmental extremes; (2) the development and validation of operational and thermoregulatory models to characterize soldier performance in harsh environments; and (3) the utilization of resources in thermal strain prediction models and the incorporation of technological advances in satellite data collection and image processing, which are vital to the soldier. USARIEM researchers are able to perform quantitative assessments of the heat and vapor transfer characteristics of clothing and individual protective systems through the use of USARIEM's state-of-the-art thermal models and manikin systems. Research efforts of this division result in the generation of mechanisms for implementing physiological thermal predictive control strategies useful in all global environments (USARIEM, 1997a).

2.4.4 Military Nutrition and Biochemistry Division

The USARIEM Military Nutrition and Biochemistry Division conducts research on a variety of nutritional issues affecting military personnel of all branches of the DoD. This division also provides guidance to military personnel on nutritional issues and assists the Office of The Surgeon General of the Army in fulfillment of its duties as the DoD executive agent responsible for nutrition. Research conducted by this division focuses on developing nutritional

interventions to enhance the physical and mental performance and health of the soldier in any global environment. Field, laboratory, and garrison (military post) studies are conducted to examine energy expenditure, nutritional status, and patterns of food consumption. In addition, the effects of nutrition on physical and mental performance, brain function, and immune status are also explored. Field studies are conducted by this division to determine optimal nutritional combinations of food rations, assess new food rations, and investigate the interactions between soldier performance, nutrition, and environmental stresses. As a result of this research, the Military Nutrition and Biochemistry Division recommends the consumption of healthy foods and discourages the intake of foods containing excessive amounts of fat, cholesterol, and sodium (USARIEM, 1997a).

This Division also identifies and clarifies the etiology and pathophysiological mechanisms of injuries and illnesses caused by harsh environments. Decreased physical performance due to exposure to extreme heat, severe cold, or high altitude is evaluated using models designed to improve soldier performance. The additive or synergistic effects of environmental stresses and chemical agent simulants and treatments for these agents are also examined. The long-term goal of this research is to develop or improve preventive measures and innovative treatments for a wide variety of injuries and illnesses induced by exposure to environmental stresses (USARIEM, 1997a).

2.5 General Safety

In accordance with SSCOM Memorandum (SSCOM-M) 385-17, *Preparation of Standing Operating Procedures for Safety and Hazardous Materials*, a Standing Operating Procedure (SOP) is required for all hazardous operations conducted by civilian and military personnel of SSCOM or one of its tenant organizations (e.g., USARIEM). Hazardous operations requiring an SOP are defined as (1) research activities involving the use of pathogenic organisms in which the potential for infection or release of potentially infectious materials exists; (2) research involving radionuclides; (3) the utilization of electromagnetic equipment, lasers, or x-ray equipment, which may impact the safety of the researcher; (4) the utilization of highly or acutely toxic chemicals, severe poisons, or known or suspected human carcinogens, teratogens, or mutagens; and (5) any other hazardous operations that may pose a risk to the researcher. SOPs generated and approved under SSCOM-M 385-17 are designed to prevent accidental injury or death to personnel and to reduce or eliminate property damage through the implementation of safety measures, utilization of safety equipment, and execution of safe working procedures. Compliance with an SOP for a particular activity will also ensure compliance with applicable federal, state, and local regulations (SSCOM, 1997a).

The SSCOM ESHO determines which operations require a safety SOP. Once it has been determined that an operation requires an SOP, it is the responsibility of the Division Chief to prepare an SOP for that operation. The Division Chief will provide the necessary personal protective clothing and equipment (PPC&E) as identified in the SOP, ensure employee compliance with the requirements of the SOP, and provide quarterly training for individuals performing the duties and procedures described in the SOP. In addition, the Division Chief will post all signed and approved SOPs at the appropriate work locations. Employees performing the operations described in an SOP must be proficient in the procedures and as proof of understanding, employees are required to read and sign the SOP on an annual basis. Employees are also required to wear the specified PPC&E and to follow the prescribed step-by-step working procedures without deviation (SSCOM, 1997a).

During the development of an SOP, the ESHO will perform a risk assessment and develop a hazard analysis. The ESHO will also identify the essential safety standards and provide guidance and assistance to the SOP preparer. It is also the responsibility of the ESHO to identify environmentally sound requirements for the storage, disposal, treatment, decontamination, and spill containment and clean-up for all materials. The format for SOPs for hazardous operations conducted at the SSCOM installation, as provided in SSCOM-M 385-17, includes a statement of work, identification of responsibilities, the nature of materials used in the operation, the nature of hazard(s) involved, safety equipment and procedure requirements, and first aid emergency procedures. All draft SOPs are reviewed by the ESHO and the U.S. Army Occupational Health Clinic (Health Clinic) to ensure adequacy and compliance with applicable standards and regulations. The ESHO must approve all final SOPs and the Health Clinic must concur/nonconcur with all final SOPs. SOPs are reviewed on an annual basis for compliance with current laws and regulations as required by U.S. Army Materiel Command Regulation 385-100, *Safety Manual*. All SOPs automatically expire 2 years after the date of approval (SSCOM, 1997a).

The Health Clinic, located on the SSCOM installation, evaluates the potential health risks to workers from exposure to chemical or biological hazards in the workplace. Based on the health risks identified, the Health Clinic will prescribe engineering controls and/or PPC&E necessary to protect the workforce. The Health Clinic determines the fundamental occupational health standards and provides guidance and assistance to the SOP preparer. The Health Clinic also evaluates employee medical records to ensure that the employee is capable of performing the tasks identified in an SOP. To ensure protection of the workforce, the Health Clinic monitors for potential employee exposure to toxic chemicals or hazardous substances. The clinic also performs long-range workplace exposure monitoring to determine the subclinical effects of long-term, low-level exposure to hazardous or toxic substances (SSCOM, 1997a).

SSCOM has also developed the *Laboratory Standardization for Safety and Hazardous Waste Management Audit Compliance* to standardize all of the laboratories located on the Installation. Laboratory standardization procedures include assigning lab managers and alternates to each laboratory, container labeling, chemical storage, hazardous waste Satellite Accumulation Areas (SAA) in each generating laboratory, and educational programs. The purpose of standardization is to facilitate both environmental and safety compliance audits of the laboratories on the installation. In addition, the Installation Safety Office has provided USARIEM with general emergency procedures for chemical spills. SSCOM has also developed a Fire Protection Program that identifies procedures for fire prevention and protection through personnel training, continuous inspections, and periodic fire drills.

2.6 Security

SSCOM maintains a closed post at the Natick, Massachusetts facility. A closed post is an Army installation in which access is continuously controlled by perimeter barriers with guarded limited-entry points. There is only one entrance to the installation and it is guarded by an SSCOM Security Officer at all times. During normal duty hours, only those individuals with a pass are permitted to enter the installation. Visitors to the installation are required to show proper identification and obtain a visitor pass at the main gate. USARIEM SOP No. 1 dated December 9, 1996 identifies security measures and emergency procedures specific to USARIEM (USARIEM, 1996a).

2.7 Pollution Prevention

Environmental management at USARIEM includes the prevention of pollution through design/process modifications in accordance with NEPA and AR 200-2 (Army Acquisition Pollution Prevention Support Office (AAPPSO), 1994). Pollution prevention practices include source reduction, closed-loop recycling, other types of recycling, energy recovery, and hazardous waste treatment or disposal. One current pollution-prevention measure that is in place at USARIEM is the use of nonhazardous or less hazardous alternatives to hazardous materials. A chemical inventory control program for all tenants on the installation includes review of all purchase requests, barcodes, and an automated tracking system; it should be operational during fiscal year 1998 and will allow tenants to effectively share excess chemicals. Ideally, this new program will result in reduced consumption of hazardous materials and incorporate shelf-life management techniques to prevent excess serviceable materials from expiring. These pollution-prevention measures will result in the decreased generation of hazardous waste. In addition, USARIEM incinerates permitted infectious waste thereby reducing the amount of waste requiring landfill disposal.

2.8 Waste Stream Management

SOPs have been developed and implemented for the collection, treatment, and disposal of wastes generated by USARIEM. USARIEM generates wastewater and general solid, infectious, hazardous chemical, and radiological wastes.

2.8.1 Wastewater

USARIEM activities consume approximately 4.0 million gallons of water per year, and wastewater is generated by laboratories and restroom facilities (Manning et al., 1997). Wastewater generated at USARIEM does not require special pretreatment prior to discharge. All wastewater generated by USARIEM is discharged into the Massachusetts Water Resources Authority (MWRA) sanitary sewer system for subsequent treatment.

2.8.2 General Solid Waste

General solid waste is waste that does not contain regulated materials such as infectious waste or hazardous chemicals. General solid waste is managed and disposed of by normal waste disposal methods without any pretreatment. At USARIEM, general solid waste is disposed of in trash receptacles located throughout the facility. Maintenance personnel collect the trash from the receptacles and deposit the waste in SSCOM dumpsters. An approved contractor picks up the solid waste, transports it from the installation, and disposes of it in accordance with federal, state, and local regulations (Durkot, 1997b). On an annual basis, USARIEM generates approximately 1,500 cubic yards of solid waste, which represents approximately 10% of the total solid waste generated by the installation (Manning et al., 1997).

2.8.3 Infectious Waste

USARIEM Memorandum (USARIEM-M) 385-5 describes the policies, procedures, guidelines, and responsibilities for the handling and disposal of infectious waste. All USARIEM personnel involved in research in which potentially infectious waste is generated must follow the procedures identified in this memorandum. The requirements of USARIEM-M 385-5 also apply to the Natick U.S. Army Health Clinic, SSCOM, and other agencies that currently maintain a Memorandum of Understanding (MOU) with USARIEM for the disposal of infectious waste.

According to USARIEM-M 385-5, infectious waste is defined as cultures and stocks of infectious agents and associated biologicals, blood and blood products, sharps, animal wastes, contaminated laboratory wastes, and burnable contaminated solid waste (USARIEM, 1997c). Personnel are required to wear gloves and protective clothing when handling such biohazardous waste. Infectious waste is segregated from all other types of waste at the point of generation. Non-burnable infectious waste which includes sharps, syringes, foil, and glass test tubes are disposed of and stored in red plastic sharps containers (Gentile, 1996). USARIEM generates approximately 1,500 pounds of sharps and non-burnable infectious waste annually. When a sharps container is full, the box is secured and placed in two individually sealed biohazard bags or one double-lined biohazard bag (USARIEM, 1997c). Full sharps containers are stored in an upright position in a biohazardous waste cooler prior to shipment by an approved contractor for off-site disposal (Gentile, 1996). Noncontaminated glass is disposed of as ordinary solid waste (USARIEM, 1997c).

USARIEM operates a pathological (infectious) waste incinerator in accordance with a Massachusetts Department of Environmental Protection (MDEP) permit. USARIEM is permitted to run the incinerator once in a 24-hour period. Each burn is recorded on a chart to monitor the temperatures of the primary and secondary chambers of the incinerator (USARIEM, undated[a]). An incinerator operations log sheet is maintained to document the date and contents of each burn (Tobias, 1997). USARIEM may burn 100 pounds of permitted waste per burn (USARIEM, undated[b]). Typically, USARIEM burns 30-pound loads which maximizes the efficiency of the incinerator and reduces the potential for generating smoke. In 1996, USARIEM burned approximately 1,000 pounds of waste in the on-site incinerator (Durkot, 1997a; Environmental, Safety, and Health Directorate, 1997; Manning et al., 1997).

Burnable infectious solid waste products including disposable gloves, papers, plastic test tubes, blood-soaked gauze, and plastic pipettes and vials are disposed of in double-lined biohazard burn boxes (Gentile, 1996; USARIEM, 1997c). Full boxes are sealed with cellophane tape, weighed, and labeled with the investigator's name, directorate, date, contents, and weight. Infectious waste containers must be handled and stored in a manner so that no discharge or release occurs and no nuisances are generated. Full infectious waste containers may be held for on-site treatment for up to 4 days at room temperature. If the storage time exceeds 4 days, the waste must be refrigerated until on-site incineration or disposal by an approved contractor. Burnable infectious waste is either incinerated on-site or transported off-post by an approved biohazardous waste contractor for disposal (Gentile, 1996). USARIEM currently ships approximately half of their burnable infectious waste off-site for disposal (USARIEM, undated[a]). Biological liquid waste generated by analytical equipment (e.g., hemoglobinometer) is collected directly from the equipment into burnable, leakproof 5-gallon containers (USARIEM, 1997c).

2.8.4 Hazardous Waste

Hazardous waste is collected in SAAs located in each generating laboratory. Laboratory managers are responsible for inspecting SAAs weekly to ensure compliance. Once a hazardous waste container is full, the accompanying tag must be completed and include a description of the contents of the container and the associated hazards. USARIEM generates approximately 1,000 pounds of hazardous waste annually. Full hazardous waste containers are transported to the

SSCOM turn-in area within 3 days for proper disposal. Hazardous wastes are tracked from generation to disposal and may not be held on the installation for more than 90 days. An SSCOM-approved contractor collects and transports hazardous wastes off site for disposal (Manning et al., 1997).

2.8.5 Radiological Waste

SSCOM maintains a U.S. Nuclear Regulatory Commission (NRC) permit (NRC License Number 20-00315-02) for the use of specified radionuclides for research and development purposes (NRC, 1996). USARIEM generates approximately 7 cubic feet of radiological waste per year. The remainder of the installation generates 2 cubic feet per year (Manning et al., 1997). USARIEM is permitted to use radionuclides in accordance with the requirements of the SSCOM NRC permit. In accordance with NRC regulations (10 CFR 20.2003), liquid waste that contains radioisotopes (e.g., tritium [^{3}H], carbon-14 [^{14}C], phosphorus-32 [^{32}P]) below a specified activity level is no longer considered radioactive, and if in a nonbiological and nonhazardous aqueous solution (e.g., water), can be properly disposed of into the sanitary sewer system. The quantity of radioactive materials that can be released into the sewer system varies depending on the radioisotope.

Liquid and solid wastes that contain radioisotopes with a short half-life (i.e., <120 days) such as ^{32}P, chromium-51 (^{51}Cr), and iodine-125 (^{125}I) are generally collected in a container and transported to the SSCOM storage area. In the SSCOM storage area, the waste is allowed to age and decay to safe levels, typically, 10 half-lives (approximately 2 years) at which point it is no longer considered radioactive. Once the waste is no longer radioactive, it can be properly disposed of, based on the nature of the waste, in accordance with NRC regulations. If the waste is of a biological nature, it will be incinerated at USARIEM. If the waste is a liquid, it will be disposed of down the drain. Solid waste that contains radioisotopes with a long half-life (i.e., >120 days) such as ^{3}H and ^{14}C are shipped off-site for land burial (Durkot, 1997b).

2.8.6 Pesticide Management

The SSCOM Pesticide Management Program applies to the entire installation, including housing areas, and is available to the public to review upon request. Pest management activities are performed by contractors and monitored by SSCOM. Contractors applying pesticides must be licensed and must comply with Massachusetts regulations as well as DoD-mandated requirements. Since 1993, SSCOM has reduced its pesticide usage by as much as 50%.

2.8.7 Asbestos Management

SSCOM has an Asbestos Management Plan and SOPs to ensure compliance with asbestos regulations and the protection of personnel. The Installation Asbestos Survey is updated continuously.

2.9 Quality Assurance

In accordance with USARIEM-M 70-68, USARIEM has developed a Quality Assurance Program (QAP) to ensure that all research conducted by USARIEM investigators complies with applicable medical, professional, legal, scientific, and ethical procedures and standards. This program is also designed to ensure that all investigators and technicians are fully qualified and certified to execute their assigned duties. Several committees have been created under the QAP to review, evaluate, and ensure that all USARIEM research projects meet established standards

prior to commencement. The committees are the Scientific Review Committee (SRC), the Human Use Review Committee (HURC), and the Credentials Committee (USARIEM, 1996b). All research protocols must be processed through the QAP prior to approval and implementation (Durkot, 1997a).

The SRC evaluates research protocols for scientific validity, accuracy, and merit. The HURC assesses each protocol to determine whether the project adheres to established standards regarding the health and welfare of human subjects. An Institutional Animal Care and Use Committee reviews protocols requiring animals for adherence to established standards for the health, welfare, and use of laboratory animals. The Credentials Committee ensures that only qualified individuals execute research procedures at USARIEM. Medical Monitors provide quality medical surveillance, coverage, and support for human volunteers during research studies (USARIEM, 1996b).

2.10 Human Volunteers

Human volunteers are used as a part of the research program at USARIEM. All research protocols involving the use of human subjects must be reviewed, evaluated, and approved by HURC prior to initiation. According to USARIEM-M 70-25, *Human Research,* the HURC is composed of 10 members, including three physicians, a member of the legal community, and at least one individual who is neither a physician nor a scientist (USARIEM, 1998). Each protocol is evaluated to determine whether a minimal risk or more than a minimal risk is posed to human subjects, the protocol conforms to the USARIEM type protocol, the protocol includes adequate safeguards for human subjects, the benefits of the research justify the risks to human volunteers, and whether the protocol ensures that proper informed consent procedures will be followed (USARIEM, 1996b; USARIEM, 1998).

Regulations that apply to research activities involving the use of human subjects at USARIEM include: 10 USC 980; 10 USC 1102; 32 CFR 219; 45 CFR 46; 21 CFR A, D, and H; AR 70-25; USAMRDC 70-25, and USARIEM-M 70-25. All research involving human subjects at USARIEM must comply with these regulations, regardless of where the study is executed, the source of research subjects, or the level of responsibility. All human subjects must be volunteers who are fully informed of the research procedures and their associated risks. Volunteers will acknowledge informed consent for participation in the study by completing DA Form 5305-R, *Volunteer Affidavit Agreement*. Maintaining the protection and confidentiality of information obtained from research subjects must be performed in accordance with federal laws and Army regulations. Research subjects may withdraw from studies at any time. A Medical Monitor is assigned by the Commander, USARIEM for the medical care of subjects used in research at USARIEM. It is the responsibility of the Medical Monitor to ensure the safety and well-being of subjects during a study and to provide emergency treatment for any medical condition that develops during or immediately following a study (USARIEM, 1998). The Medical Surveillance and Risk Management Committee monitors the research subject health surveillance database to document medical findings and trends associated with participation in research studies at USARIEM (USARIEM, 1996b). Further, prior to the commencement of any research project that involves connecting electronic instrumentation to human subjects, the Principal Investigator for the study must ensure that an electrical safety inspection has been conducted (USARIEM, 1998).

2.11 Animal Care and Use

Laboratory animals used in USARIEM research activities include rabbits, rats, pigs, and goats. The USARIEM animal facilities have been accredited by the Association for Assessment and Accreditation of Laboratory Animal Care (AAALAC) since 1969 (Tobias, 1997). Criteria for AAALAC certification encompass all aspects of animal care and use, including research management, veterinary care, and physical facilities.

Research involving the use of laboratory animals at USARIEM must be conducted in a manner that ensures humane treatment of animals and that animals will not experience pain, suffering, or stress. Research protocols involving animals must be approved by the Institutional Animal Care and Use Committee (IACUC) prior to initiation. Regulations governing the care and use of laboratory animals at USARIEM include the Animal Welfare Act, 9 CFR 1; National Institutes of Health (NIH) Publication #85-23; and AR 70-18, USARIEM-M 70-16, and USARIEM-M 70-18. Animal facilities are inspected twice yearly by the IACUC. IACUC members include a veterinarian and at least one individual not directly involved with USARIEM research activities (USARIEM, 1996c; USARIEM, 1996d).

2.12 Human Health and Safety

2.12.1 Worker Health and Safety

Research, education, clinical, and diagnostic activities pose varying degrees of risk to worker health and safety depending upon the etiologic agents and activities in operation. To minimize risks, special laboratory practices and techniques, safety equipment, and facility design are employed. Each biosafety level (BL) is a combination of these elements appropriate for the operations performed, the known or suspected routes of transmission of the infectious agents, and the function of the laboratory necessary to protect laboratory workers, the public, and the environment. The degree of risk dictates the BL requirements necessary for protection. BLs are designated in ascending order, by degree of protection provided to workers, the public, and the environment. The lowest level is a BL-1 laboratory, which is suitable for work involving well-characterized agents not known to cause disease in healthy adult humans, and involve minimal risk to the laboratory worker and the environment (Centers for Disease Control and Prevention [CDC]/NIH, 1993). All of the laboratories operated by USARIEM are BL-1, and all work is conducted with well-characterized infectious agents. SSCOM-M 385-69, *Biological Safety Program*, identifies the procedures and responsibilities for conducting research activities with potentially infectious agents (SSCOM, 1996a).

USARIEM employees are required to conduct all laboratory operations in accordance with the procedures identified in the appropriate SOPs, Material Safety Data Sheets (MSDSs), and the SSCOM Chemical Hygiene Plan (CHP). The CHP sets forth responsibilities and procedures for the handling of hazardous chemicals in laboratories on the installation. Included in the CHP are specific requirements for the procurement, storage, handling, inventory, distribution, and disposal of various types of hazardous chemicals. The plan also calls for the use of appropriate engineering controls, including chemical hoods, glove boxes, and local exhaust ventilation for laboratory operations to minimize worker exposure to hazardous chemicals. In addition, design and performance criteria for the engineering controls are specified in the CHP. Administrative controls for laboratory activities involving the use of hazardous chemicals include the posting of appropriate signs and labels. In accordance with the CHP, USARIEM has the name of the laboratory manager and an alternate individual and their respective phone numbers posted at the

entrance to each laboratory room. All emergency eyewashes, safety showers, fire extinguishers, and other safety equipment must be properly labeled. The CHP also identifies proper work practice controls for the handling of chemicals, use of laboratory glassware, and use of chemical hoods to ensure employee protection. Employee training, PPC&E, personal hygiene, first aid, medical surveillance, and housekeeping requirements are established in the CHP for the protection of the workforce. USARIEM laboratories are routinely inspected by the Chemical Hygiene Manager (CHM) and periodically, but at least annually, by the ESHO. At a minimum, the Health Clinic conducts annual industrial hygiene surveys of all laboratories on the Installation (SSCOM, 1997b).

SSCOM-M 385-2 establishes the Hazard Communication (HAZCOM) Program for the Installation. This program provides civilian and military personnel with information about hazardous substances, proper chemical labeling requirements, MSDSs, training, and other forms of warning. The ESHO and the Health Clinic perform periodic inspections of facilities to ensure compliance with the HAZCOM Program and applicable laws and regulations (SSCOM, 1996b). In accordance with SSCOM-M 385-2, each division of USARIEM that conducts operations involving hazardous chemicals has developed a HAZCOM Program to educate and protect employees.

Many of the research activities conducted at USARIEM involve working with human blood or other body fluids. When working with human blood, plasma, or serum all USARIEM personnel are required to operate under the Universal Precaution Principle, which states that all human blood must be handled as though it is infected with the human immunodeficiency virus (HIV) or the Hepatitis B virus. Workers may be exposed to these viruses as a result of an accidental needlestick, a cut from broken glass, or contact of infected blood with an open wound or mucous membranes. The *Exposure Control Plan for Bloodborne Pathogens* (USARIEM-M 385-12) identifies the work practice controls, PPC&E, housekeeping, and training requirements to prevent exposure of employees or research volunteers to blood and other potentially infectious materials. All contaminated equipment is decontaminated prior to disposal or shipping. All laboratory work surfaces are decontaminated with a chemical germicide or a 1% bleach solution following a spill of blood, plasma, or serum. The Health Clinic provides Hepatitis B vaccination, medical surveillance, and evaluation and follow-up care after exposure incidents for all USARIEM employees identified as having a risk of exposure to blood or other potentially infectious materials (USARIEM, 1997d). USARIEM-M 385-3 identifies similar requirements and procedures for the handling of biological tissues for the protection of human volunteers and researchers at USARIEM. This memorandum also prescribes the procedures for the proper selection and use of disinfectants to decontaminate equipment and materials that have come in contact with the human body (USARIEM, 1994).

2.12.2 Accidents and Incidents

SSCOM employs the DA's "clinic first" policy for accidents that occur on the Installation. This policy requires that injured employees must first report to the Health Clinic for medical treatment before seeing their private physician, unless it is an emergency situation. According to SSCOM-M 385-7, *Accident Reporting*, SSCOM Form 1125 must be completed for all injuries to military and civilian personnel. For lost-time injuries to military personnel or damage to Army or non-Army property in excess of $2,000, DA Form 285 must be prepared. Occupational Safety and Health Administration (OSHA) Form CA-1 must be completed for traumatic injuries and OSHA Form CA-2 must be completed for occupational diseases to federal employees. The ESHO

conducts accident investigations to determine causal effects and provides recommendations to prevent a reoccurrence. In addition, periodic reviews of accident records and reports are conducted to identify any accident trends and to recommend countermeasure programs for accident prevention (SSCOM, 1996c).

All reported injuries, illnesses, deaths, and/or accidents involving damage to government personnel or property at USARIEM must be reported in the SD Log (DA Form 1594). In addition, all injuries will be reported to the Health Clinic no later than the day after the incident. The Detachment Commander or Chief Medical Noncommissioned Officer (NCO) will be notified of all serious injury or illness incidents (USARIEM, 1996a).

There are no SSCOM physicians on-call during nonduty hours. Therefore, in the event of a medical emergency involving minor injuries or illnesses at USARIEM during nonduty hours, civilians will be taken to Columbia Metro West Medical Center - Leonard Morse Campus in Natick and military personnel will be taken to Hanscom Air Force Base (AFB). For accidents or incidents resulting in serious injuries or illnesses, individuals will be sent to the most convenient medical facility, including the Columbia Metro West Medical Center - Framingham Union Campus, the Leonard Morse Campus, or the Hanscom AFB Clinic. If the situation warrants, the Natick Fire Department may be contacted for assistance (USARIEM, 1996a).

In the event of a fire at USARIEM, Natick Security will be contacted immediately with the type (e.g., paper, chemical, or electrical) and location of the fire. Any individual that identifies a fire at the facility will also sound the fire alarm and take action to contain the fire, which includes utilizing the appropriate fire extinguisher, closing all doors and windows on the same floor, and ensuring that the main door to Building 42 is not locked. Emergency access keys for USARIEM are maintained at the installation main gate and by the Fire Marshall. Pertinent information regarding the fire will be recorded in the SD Log (DA Form 1594). The Detachment Commander and the Chief Medical NCO will be notified of the fire when the Natick Fire Department arrives on site (USARIEM, 1996a).

The USARIEM SD will notify SSCOM Security if a hazardous material spill has occurred. SSCOM Security will then notify the SSCOM Hazardous Material (HAZMAT) team, which is composed of both chemical and petroleum units, and determine whether a HAZMAT team must be activated. The HAZMAT team is kept up-to-date on issues and methods regarding hazardous material spill incidents through a continuous training program. The SD will also notify the Chief Medical NCO, Adjutant, Executive Officer, or the Commander in the event of a spill. The SD will record the appropriate information in the SD Log. The hazardous material spill area will be off limits to all personnel (USARIEM, 1996a).

3.0 ALTERNATIVES CONSIDERED

3.1 Introduction

The proposed action and subject of this EA is the continuation of Army Operational Medicine Research Program activities at USARIEM in their present scope and size (Alternative I, the Preferred Alternative). During the preparation of this EA, two alternatives to the proposed action were identified. These alternatives are: relocation of the research activities to a site other than USARIEM (Alternative II) and the cessation of the research activities conducted at USARIEM (Alternative III, the No Action Alternative).

3.2 Alternative I – Continued Operation of USARIEM in Its Present Scope

Alternative I involves the continuation of current and planned future Army Operational Medicine research activities at USARIEM in their present scope and in existing facilities. This alternative is the preferred alternative because the present research efforts at USARIEM are considered essential to the mission of USAMRMC. In addition, the existing USARIEM location offers state-of-the-art technology and facilities for research activities. Activities conducted at USARIEM provide U.S. military personnel with a full range of physical and mental capabilities to endure the stress of heat, cold, fatigue, and psychological factors in addition to the threat of weapons and uncertainty during wartime. Therefore, Alternative I is the option that best meets the needs of national defense.

3.3 Alternative II – Relocation of USARIEM Research Activities

This alternative entails conducting USAMRMC Army Operational Medicine research activities at a location other than USARIEM. This alternative is not the preferred alternative because the state-of-the-art research facilities and technologies at USARIEM would no longer be utilized for the benefit of the Army Operational Medicine Research Program. Constructing a new facility or modifying an existing facility for these research activities would not be cost-effective and would delay research progress.

3.4 Alternative III – Cessation of USARIEM Research Activities (No Action Alternative)

Alternative III entails the cessation of the Army Operational Medicine research activities that are currently conducted at USARIEM. This alternative is not the preferred alternative, because closing USARIEM would discontinue a significant component of the Army Operational Medicine Research Program. In addition, Alternative III would impair the national defense posture by reducing the protection provided to U.S. military personnel on the battlefield.

4.0 AFFECTED ENVIRONMENT

4.1 Introduction

This section of the EA describes aspects of the biophysical and socioeconomic environment (i.e., resource areas) that could potentially be impacted by the proposed action.

4.2 Location and Physical Description

USARIEM is a tenant of the SSCOM Installation, which is located in Natick, Massachusetts. The installation occupies 74.1 acres and is situated on a peninsula along the eastern shore of Lake Cochituate (see Figure 4-1) (National Oceanic and Atmospheric Administration [NOAA], 1997). The town of Natick occupies approximately 16 square miles in Middlesex County and lies in the eastern part of Massachusetts (see Figure 2-2). Natick is located 18 miles southwest of Boston, and 35 miles north of Providence, Rhode Island (Department of Housing and Community Development, 1997). Neighboring towns include Weston, Wellesley, Dover, Sherborn, Framingham, and Wayland.

4.3 Land Use

The SSCOM Installation is surrounded by the town of Natick, which is an economically developed suburb located in eastern Massachusetts. There are a variety of land uses in Natick, ranging from agricultural to industrial. Residential and commercial development comprises most of the town. There are five residential and commercial centers: Natick Center, South Natick, West Natick, Lokerville, and Sunkaway. The largest portion of the region is composed of residential areas that occupy approximately 4,400 acres (42.4%) (Department of Housing and Community Development, 1997). These areas are relatively dense, older housing neighborhoods that are located near Natick Center and South Natick, and low-density single-family housing that is found throughout the remainder of the town. Other land uses in the area include water (6.0%), commercial (4.4%), agriculture (3.8%), urban open land (3.8%), industrial (2.7%), and other (34.3%). Commercial development is prominent along Route 9. Adjacent areas are zoned for industrial purposes. The town maintains a comprehensive plan that establishes zoning ordinances (Department of Housing and Community Development, 1997).

4.4 Climate

The climate of the Boston area is relatively mild as a result of its proximity to Massachusetts Bay and the Atlantic Ocean (Reed Travel Group, 1997). Mean monthly temperatures in the Boston area range from 73.5°F (summer) to 28.6°F (winter), with the highest temperatures generally occurring in July and the lowest temperatures occurring in January (National Climatic Data Center, 1990; Reed Travel Group, 1997). Average high and low temperatures recorded for the City of Boston in the last 29 years range from 81.8°F to 21.6°F (National Climatic Data Center, 1990). Normal temperatures in Natick average 73.2°F in July and 27.5°F in January. Rain and snow are abundant in the Natick region. The average annual precipitation for Natick is approximately 45 inches, with monthly averages ranging from 3 to 5 inches (Sanford Ecological Services, Inc., 1995). The annual snowfall for the Boston area is approximately 42 inches (Reed Travel Group, 1997). Winter storms following a direct coastal route may bring snow to Natick, while communities to the east may be affected by rain as a result of the warming ocean wind. The opposite may occur when cooling ocean winds do not reach Natick (Sanford Ecological Services, Inc., 1995).

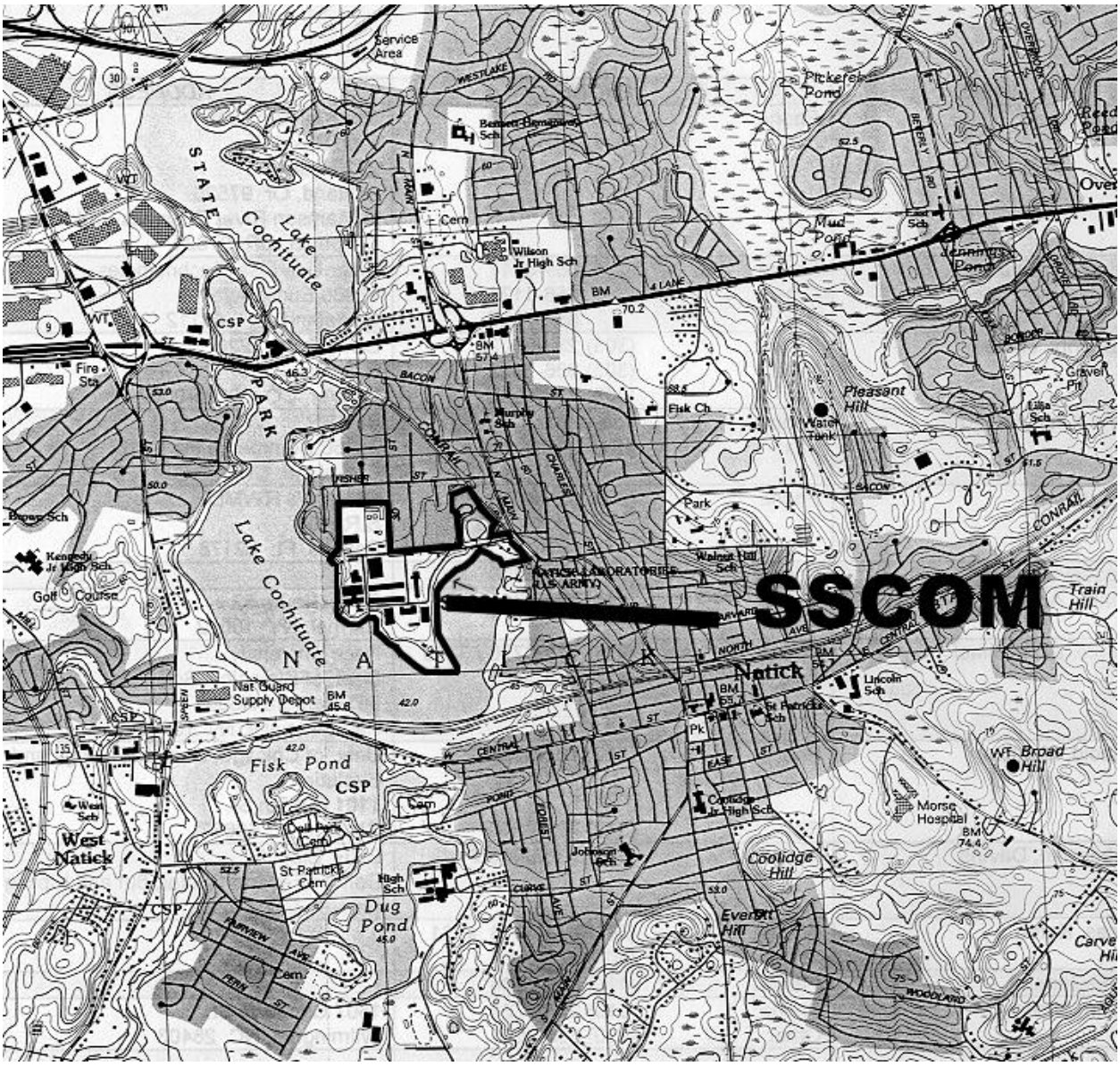

Figure 4-1 Location of SSCOM in the Natick, Massachusetts Area

4.5 Geology

The Natick area is characterized by low-elevation terrain that is generally less than 200 feet above mean sea level (msl). Upland areas range from the broad, dominant slopes of Drury Hill, Pleasant Hill, and Carver Hill to the low rolling areas of Natick Center. Elevations in the area range from 410 feet at Pegan Hill to approximately 135 feet along the Charles River and at Lake Cochituate. Pegan Hill is located southeast of the Charles River. Carver Hill (300 feet), Broad Hill (312 feet), Train Hill (300 feet), and Pleasant Hill (313 feet) run from Pegan Hill along the eastern side of Natick to Route 9. In western Natick, Drury Hill (300 feet) and Tom Hill (300 feet) are the dominant slopes (Sanford Ecological Services, Inc., 1995).

Bedrock outcrops are common in the hilly areas of southern Natick although most of Natick's underlying bedrock is covered by surficial deposits. The region between Indian Brook, Dug Pond, Everett Hill, and Davis Brook contains the largest area of rock outcrops. The dominant geologic feature of the area is stratified deposits of well-compacted glacial till that occurs in both the Charles and Sudbury River Watersheds. These till deposits are the result of glaciers receding from the region (Sanford Ecological Services, Inc., 1995).

The large preglacial valley carved into the bedrock between Sunkaway, Morses Pond, Coolidge Hill, Indian Brook, and the Charles River contains till deposits that are generally less than 20 feet thick. These till deposits are composed of gravel, sands, and clay combined in a poorly sorted mixture. This area is a large source of water for the region; several of Natick's water supply wells are located here. The western and southern portions of Natick contain the oldest till deposits. A large area surrounding Lake Cochituate contains glacial lake and stream deposits known as the East Natick Stage. Organic deposits cover the poorly drained regions around Natick, and swamp deposits cover the wetland areas. The banks of the Charles River are lined with alluvial deposits with river terrace deposits extending upgradient of the banks.

Paleozoic and pre-Paleozoic rocks underlie Massachusetts. Metamorphic and igneous rocks such as granite, greisses, and schists are common in Massachusetts. Large amounts of sedimentary rocks are found only near major river valleys (State of Massachusetts, 1997).

4.6 Soils

The *1995 Middlesex County, Massachusetts Interim Soil Survey Report* indicates that USARIEM is located on urban land. Urban land is defined as regions in which 75% or more of the surface area is covered by asphalt, concrete, buildings, industrial areas, or other impervious surfaces. Urban land areas in the county have slopes ranging from level to steep (Middlesex Conservation District, 1995).

Soils located adjacent to the urban areas in the county consist of the Deerfield series and the Hinckley series. The Deerfield series consists of deep, moderately well-drained soils, which are found on glacial outwash plains, terraces, and deltas. The Deerfield soil series has a loamy fine sand-to-sand surface layer with 0 to 3% slopes. The permeability of the soils is rapid to very rapid. The seasonally high water table ranges from 18 to 36 inches. These soils are poorly drained, limiting plant growth and cultivation, but artificial drainage can be used to make soils more suitable for plant growth and cultivation. The Deerfield series is recognized as being statewide or locally important for agricultural purposes (Middlesex Conservation District, 1995).

The Hinckley soil series covers nearly 50% of Natick and consists of deep, excessively drained soils found on glacial outwash plains, kames, eskers, and terraces. The Hinckley soil series ranges from nearly level to very steep with slopes of 15% to 25%. Typically, these soils are brittle or loose, gravelly and very gravelly sandy loam to loamy coarse sand surface soil and subsoil. In general, Hinckley soils have rapid permeability. The substratum consists of loose stratified sands and gravel at 12 to 30 inches, which have very rapid permeability. This soil type is classified as having severe limitations due to the slope (15% to 25%) and dryness of the soil that makes it generally unsuitable for cultivation (Middlesex Conservation District, 1995).

4.7 Water Resources

4.7.1 Surface Water

Water bodies and associated wetlands cover about 13.5% of the total area of the Town of Natick. Natick is divided between the Charles River Watershed in the eastern and southern portions of town, and the Sudbury River Watershed in the west and north. USARIEM lies in the Lake Cochituate Watershed, which is part of the Sudbury River Watershed; of the Sudbury, Assabet, and Concord Rivers (SuAsCo) Watershed; and of the Merrimack River Watershed. The Lake Cochituate Watershed covers approximately 17 square miles in the towns of Ashland, Framingham, Natick, Sherborn, and Wayland in Middlesex County (Miller Microcomputer Services, 1997a). Land use within the watershed consists of residential, industrial and urban. Lake Cochituate State Park owns a small margin of land surrounding the majority of the lake.

Lake Cochituate has a surface area of 625 acres and a depth of 65.6 feet at its deepest point. The lake is divided into three main ponds and two connector ponds. In addition, Dudley pond is located immediately north of Lake Cochituate, and Fisk pond lies immediately south of the lake (Miller Microcomputer Services, 1997a). Cochituate Brook, the outlet for Lake Cochituate, flows approximately 0.6 miles into the Sudbury River, which merges with the Assabet River approximately 16 miles downstream to form the Concord River. The Concord River flows into the Merrimack River, which discharges into the Atlantic Ocean approximately 37 miles downstream (NOAA, 1997).

Storm sewers are used to divert stormwater run-off from the Installation into Lake Cochituate. All surface water from the Installation drains into Lake Cochituate. A french drain along the shoreline of the former proposed gymnasium site and overflow from the Little Roundy Pond located northeast of the former proposed gymnasium area discharge into Lake Cochituate.

Municipal water is supplied to the SSCOM Installation by the Town of Natick Public Water Department (see Section 4.7.2). Wastewater generated by USARIEM research activities does not require special pretreatment and is discharged directly into the sanitary sewer system. The sewer system is owned and maintained by MWRA. SSCOM maintains a Sewer Use Discharge Permit (No. 22 001 808) with MWRA for discharges from the Installation as a whole (MWRA, 1997a). The discharge limitations as set forth in the permit for the Installation are provided in Table 4-1.

Table 4-1. SSCOM Sewer Use Discharge Permit No. 22 001 808 Discharge Limitations

(MWRA, 1997a)

Pollutant	Daily Maximum(mg./L)[1]
Antimony	10.0
Arsenic (total)	0.5
Boron	20.0
Cadmium	0.1
Chlorinated Naphthalenes	0.8
Chromium (hexavalent)	0.5
Chromium (total)	1.0
Copper	1.5
Cyanide (total)	0.5
Fluoroanthene	1.5
Hexachlorobutadiene	3.0
Lead	0.2
Mercury	Prohibited
Nickel	1.0
PCBs	Prohibited
Pentachlorophenol	0.05
Pesticides	Prohibited
Phenol	5.0
Phenolic Compounds	0.5
Selenium	5.0
Silver	2.0
Zinc	1.0
Trichloroethylene	0.07
Phenanthrene	Prohibited
pH	5.5 - 10.5
Petroleum Hydrocarbons	15.0
Total Fats, Oils & Grease	300.0
Total Toxic Organics[2]	5.0

[1]Milligrams per liter.

[2]Any one toxic organic not elsewhere limited in these regulations may not exceed 1.0 mg/L.

Wastewater generated by the Installation flows to the Nut Island Sewage Treatment Plant. Eventually, treated wastewater is discharged into the Boston Harbor. Within the next year, wastewater generated by USARIEM and the entire MWRA southern sewer system will be routed to the Nut Island Sewage Treatment Plant for preliminary treatment (e.g., screens and grit chambers to remove large objects, sand, and gravel) (Gawrys, 1997; MWRA, 1997b). Upon exiting the Nut Island plant, sewage will be conveyed via a 4.8 mile tunnel to the Deer Island Sewage Treatment Plant for primary and secondary treatment (MWRA, 1997b). The Deer Island plant currently provides wastewater treatment for approximately two-thirds of the MWRA sewer service area. All wastewater discharges from the Deer Island Sewage Treatment Plant will be through a new 9.5-mile effluent outfall tunnel into Massachusetts Bay. The last 1.25 miles of the undersea tunnel will include 55 separate release points known as "diffusers," which will allow for a much higher rate of mixing and/or dilution of effluent (MRWA, 1997b; MRWA, 1997c). Once the transition has been made, wastewater effluent will no longer be discharged into the Boston Harbor (Gawrys, 1997).

Recreational fishing for stocked trout is common in Lake Cochituate. In 1995, the Massachusetts Department of Public Health (MDPH) issued a fish consumption advisory recommending that sensitive populations (e.g., children and pregnant or nursing women) not consume fish from Lake Cochituate due to high concentrations of polychlorinated biphenyls (PCBs) and mercury in fish tissue. The advisory also recommended that American eel in Lake Cochituate not be consumed because of PCB contamination (SSCOM, 1997c).

Various site investigations have been performed on the Installation to document any potential surface-water contamination on the site. According to the Draft Phase II Remedial Investigation Report (February 1998), 48 surface water samples were collected to establish background concentrations and to determine whether contaminants were from SSCOM stormwater outfalls. With the exception of pesticides, levels in outfall surface-water samples were lower than background levels.

4.7.2 Groundwater

Groundwater in the vicinity of USARIEM occurs at depths of 3 to 33 feet. Prior to 1995, SSCOM obtained its drinking water supply from two groundwater wells on the Installation. Due to a privatization initiative by the DA, SSCOM discontinued use of the wells in February 1995 and subsequently received official "declassification" as a public water supply in December 1996. The groundwater wells were physically disconnected from the water supply system in June 1996. The SSCOM currently receives all drinking water from the Town of Natick Public Water Department (Perodeau, 1997). USARIEM activities consume approximately 4.0 million gallons of water per year (Manning et al., 1997).

The Town of Natick drinking water supply is from aquifers and reservoirs in the surrounding region. The public water supply system consists of two reservoirs, 10 wells, and a distribution of water mains located throughout Natick (Sanford Ecological Services, Inc., 1995). The unconsolidated aquifer in Natick is composed of moderately well-sorted silty sands, sandy silts, and silty clays that lie beneath poorly, sorted, coarse to fine-grained sands. Lake Cochituate may provide up to 75% of the recharge to the aquifer in the area of the Evergreen and Springvale municipal wells. These wells may affect the direction of water flow, which is usually away from the lake (north-northwest) (NOAA, 1997). In the late 1980s, low levels of perchloroethylene (PCE) and tetrachloroethylene (TCE) were detected in some Natick municipal wells used for the

public water supply. As a result, the Town of Natick discontinued use of its Evergreen Well #1 for drinking water. In addition, the Town of Natick has recently completed a $4 million addition to the Springvale Water Treatment Plant, which includes three air strippers to transfer all or most of the VOCs from drinking water into the air, protecting the public water supply from contamination (Agency for Toxic Substances and Disease Registry [ATSDR], 1997).

4.8 Contamination at SSCOM Installation

In May 1994, the United States Environmental Protection Agency (USEPA) designated the SSCOM Installation a Superfund Site and placed the site on the National Priorities List (NPL). Cleanup of the site is being addressed in three phases which will focus on the Building T-25 Area, the gymnasium site, and the remaining areas. The SSCOM ESHO is responsible for Installation compliance with USEPA and MDEP regulations, monitoring the cleanup of contaminated sites, and administering a public relations program. According to the USEPA, the SSCOM Superfund Site does not pose an immediate risk to human health or the environment during planning and implementation of the site cleanup (USEPA, 1997). The ATSDR recently completed a Health Assessment of the SSCOM Installation that examined four potential contaminant exposure pathways for Natick residents: drinking groundwater; swimming, wading, or boating in Lake Cochituate; contact with surface soil; and consuming fish from Lake Cochituate. The Health Assessment determined that the SSCOM Superfund Site is not adversely affecting human health in the surrounding area (SSCOM, 1997c).

4.9 Plant and Animal Ecology

No state-listed rare species of plants or animals or exemplary natural communities are found on the SSCOM Installation (Arnold, 1997). An Endangered Species Survey conducted in December 1991 reported that no endangered species are known to inhabit the area occupied by the SSCOM Installation. One state-listed Species of Special Concern, the Spotted Turtle, may inhabit Little Roundy Pond at the Heritage Lane Housing area in the northeastern portion of the Installation.

The types of vegetation found in the Natick area are those typical of the eastern Massachusetts region. Deciduous and coniferous trees, including red oak, white pine, and gray birch dominate the upland areas. Many undeveloped uplands remain as grassland fields with a combination of goldenrods, asters, and upland grasses and shrubbery dominated by roses and brambles. Other common shrubs include honeysuckle, witch hazel, and European buckthorn. Maintained fields consist of domestic grasses. These areas were probably used for cultivation or pasture land in the past. Herbaceous plants in the area include club moss, common dewberry, and goldenrod (Sanford Ecological Services, Inc., 1995). A list of the more common plant species observed in the upland areas of the Town of Natick is provided in Appendix A.

The variable topography and diverse vegetation of the Natick area provide habitat for a variety of birds, mammals, amphibians, reptiles, and fish. Wet areas with abundant understory vegetation and little human intervention provide the most suitable habitats for a large number of species. Based on available information, it is assumed that species such as white-tailed deer, raccoon, squirrel, rabbit, and fox are common to the Natick region. Sightings of coyotes, beaver, and moose have recently become more common. Birds (such as sparrows, cardinals, hawks, geese, herons, and pheasants) and reptiles and amphibians (including frogs, salamanders, and snakes) are also assumed to inhabit the area (Sanford Ecological Services, Inc., 1995). A complete list of wildlife species assumed to inhabit the Town of Natick is provided in Appendix B.

Fishing is a popular sport in Natick and surrounding communities. Several water bodies, including Lake Cochituate, Dug Pond, and the Charles River, are stocked annually with approximately 3,000 rainbow and brown trout to support "put-and-take" fishing. The Massachusetts Division of Fisheries and Wildlife is responsible for managing the fish-stocking program. Common warm-water species in the area include largemouth bass, yellow perch, bullheads, pickerel, sunfish, and white sucker (Sanford Ecological Services, Inc., 1995).

There are several rare plant and animal species that have been identified in Natick. Historically, the sandplain gerardia (*Agalinas acuta*), an extremely rare plant with the highest protection priority, and the rare plant whorled pogonia (*Isotria verticillata*) have both been recorded in Natick. The plant threadfoot (*Podostemum ceratophyllum*) is a state-listed Species of Special Concern that has been identified within the riverine habitat of the Charles River. Between 1979 and 1981, the rare blue-spotted salamander (*Ambystoma laterale*) and the ecologically sensitive spotted salamander (*Ambystoma maculatum*) were sighted on 10 occasions in the Town of Natick (Sanford Ecological Services, Inc., 1995).

4.10 Wetlands

Three classes of wetlands are present in the Natick area: lacustrine, palustrine, and riverine. Although the majority of these wetlands are associated with water bodies, a few small distinct wetlands are scattered throughout the area. Cover types for these wetlands include open water, shrub-shrub, emergent vegetation, and forested (Sanford Ecological Services, Inc., 1995). A list of the more common wetland plant species observed in the Town of Natick is provided in Appendix C. Wetlands provide many valuable functions, including critical habitat for many species of wildlife such as waterfowl, white-tailed deer, mink, and otter.

Lake Cochituate is classified as a lacustrine, limnetic, open-water/unknown-bottom wetland. The region of the Installation that borders Lake Cochituate is a wetland area that is classified as littoral. The Little Roundy Pond is classified as a palustrine, open-water/unknown-bottom wetland that is associated with Lake Cochituate (U.S. Fish and Wildlife Service, 1978). This pond is located on the northeast portion of the SSCOM Installation.

4.11 Air Quality

The air quality of Natick is regulated and monitored by the Air Assessment Branch of Massachusetts Department of Environmental Protection (MDEP). The Air Assessment Branch operates 39 public ambient air-monitoring stations. The stations sample for a variety of different pollutants, including ozone (O_3), sulfur dioxide (SO_2), nitrogen oxides (NOx), carbon monoxide (CO), and particulate matter. Under the Clean Air Act (CAA), the USEPA adopted the National Ambient Air Quality Standards (NAAQS) to control the criteria pollutants (i.e., SO_2, CO, NOx, Volatile Organic Compound [VOCs], lead, and particulate matter less than 10 microns in aerodynamic diameter [PM_{10}]). The air quality data obtained from the monitoring stations are used to verify compliance with MDEP and USEPA standards (e.g., NAAQS), to provide support in developing regulations to reduce air pollution, and to meet reporting requirements of the USEPA (MDEP, 1996).

Areas that do not meet the NAAQS are designated as "nonattainment" areas. The State of Massachusetts is classified as being in "serious" nonattainment for ozone. Ground-level ozone is formed when the sun reacts with VOCs (e.g., vapors from paint and gasoline, exhaust from motor vehicles) and NOx (e.g., exhaust from motor vehicles and smoke stacks). Local weather

conditions also influence ozone levels. Higher values tend to occur on hot, clear days with a light wind. Ozone is measured hourly and exceeds USEPA health standards when levels are above 0.12 parts per million (ppm). During 1996, there were two ozone exceedance days. Some communities are also designated nonattainment for CO. This designation applied to the Boston Metropolitan Area until 1996, when the USEPA redesignated the Boston area as in attainment for CO. The last violation of CO occurred in Boston in 1986. The air quality in Massachusetts has improved during the last 10 years. The air quality of the state is influenced by industrial and commercial activity and meteorological conditions (MDEP, 1996).

The USARIEM operates a pathological waste incinerator that is permitted by the State of Massachusetts to burn potentially infectious waste (see Section 2.8.3). According to the permit, USARIEM is allowed to burn one batch per day at 100 pounds per hour (MacDonald, 1990). USARIEM typically burns only a total of 30 pounds of waste per burn cycle to increase the efficiency of the incinerator and to reduce the potential for the generation of smoke (Durkot, 1997a; Manning et al., 1997). The two primary sources of air pollutant emissions on the Installation are the boiler plant and the incinerator. A summary of the 1996 air pollutant emissions for the boiler plant, the incinerator, and other sources located on the Installation is presented in Table 4-2 (Environmental, Safety, and Health Directorate, 1997).

Table 4-2. 1996 SSCOM Air Pollutant Emissions in Pounds/Year

(Environmental, Safety, and Health Directorate, 1997)

Source	PM_{10}	SO_2	NOx	CO	VOC	TSP[1]
Boiler Plant	5,000	57,600	23,200	2,200	400	5,000
Pathological Waste	12.8	3.2	414.8	103.8	8.3	12.8
Lab Hoods				1,004.5	509.1	
Underground Storage Tank –					12.0	
Underground Storage Tank –					43.2	
Paint Hood					8.0	
Solvent Degreasers					311.0	
TOTALS	**5,012.8**	**57,603.2**	**23,614.8**	**3,308.3**	**1,291.6**	**5,012.8**

[1]Total suspended particulate.

4.12 Historical and Cultural Resources

The Town of Natick maintains two Historic Districts and several other historical features. The John Eliot District, which includes buildings from the early settlement period, is located in South Natick, and the Henry Wilson Historic District is located in Natick Center. The oldest standing house in Natick is the Sawin family home, which was the town's first grist mill. The site was built in 1696 and is located at the Audubon Society's Broadmoor Wildlife Sanctuary on South Street. The Bacon family home, located in South Natick, was built in 1704 and is also considered one of Natick's oldest buildings. Other historical features in Natick include two ancient Indian burial grounds and the Glennwood and Dell Park Cemeteries (Sanford Ecological Services, Inc., 1995). According to the Massachusetts Historical Commission, current activities at USARIEM are unlikely to affect significant historic or architectural resources (Hammer, 1997).

4.13 Energy Resources

The Boston Edison Company provides USARIEM with electricity. On an annual basis USARIEM consumes approximately 2.0 million kilowatts of electricity. USARIEM utilizes about 2,000 million British Thermal Units (mmbtu) of natural gas per year, which is provided by the Commonwealth Gas Company. USARIEM also uses approximately 600,000 pounds of steam per year, which is supplied by the SSCOM steam plant (Manning et al., 1997).

4.14 Socioeconomic Environment

In 1994, the population of Natick was 30,817 (Massachusetts Department of Revenue, 1997). The population of Natick has remained relatively stable as a result of more young people leaving the town due to an increase in the cost of living (Sanford Ecological Services, Inc., 1995). In 1990, approximately 50% of the population was between the ages of 15 and 44. Approximately 40% of Natick residents have at least a bachelor's degree. According to the 1990 U.S. Census, the median household income for Natick was $49,229. The per capita income for the same year was $22,176. In 1995, the median household income increased to $53,319 (City of Boston, 1997). The Town of Natick includes a wide variety of housing styles, sizes, and prices. The number of housing units increased by 21% from 1980 to 1990. According to the 1990 census data, there were 12,645 housing units in Natick, with approximately 69% being owner-occupied. In 1994, the median sale price for a home in the Natick area was $160,000.

In 1996, the labor force was 18,431, with an average unemployment rate of 2.7% (Massachusetts Department of Revenue, 1997). According to 1993 statistics, employment by industry for Natick was as follows: wholesale and retail trade (36%), services (28%), government (13%), manufacturing (10%), transportation and communication (6%), finance, insurance, and real estate (4%), construction (2%), and agriculture (1%) (Department of Housing and Community Development, 1997). The USARIEM currently employs 71 full-time and 10 part-time employees (Durkot, 1997a).

4.15 Environmental Justice

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority and Low Income Populations*, requires that federal agencies prepare NEPA documents to address any significant adverse impacts of federal projects on minority or low-income populations. According to 1990 census data, 93.7% of Natick's population is Caucasian, 2.3% Asian or Pacific Islander, 2.0% African American, and less than 1% American Indian, Eskimo, Aleut, or other. The U.S. Census defines the poverty level as the income level, based on family size, age of householder, and the number of children under 18 years of age, that is considered too low to meet essential living requirements without regard to the local cost of living. To be considered a "poverty area", as defined by the Census Bureau, at least 20% of the population of an area must be living below the poverty level. In 1990, 3.1% of all persons within Natick were living below the poverty level (Department of Housing and Community Development, 1997). Therefore, Natick is not considered a low-income community under Executive Order 12898.

4.16 Noise

The MDEP Division of Air Quality Control investigates complaints regarding noise pollution in the area. There are no records of complaints regarding noise originating from USARIEM on file with the MDEP Division of Air Quality Control (Hancock, 1997).

4.17 Odors

Complaints regarding air pollution are investigated by the MDEP Division of Air Quality Control. The MDEP Division of Air Quality Control does not have any record of complaints regarding odors originating from USARIEM (Hancock, 1997).

4.18 Transportation

Natick is located in the Greater Boston Area, which is accessible by rail, air, and highway. Major highways in the area include Interstate Route 90 (the Massachusetts Turnpike); State Route 9 (the Worcester Turnpike), which extends across Natick in an east-west direction; State Route 135 (Central Street), which connects communities which lie east and west of Natick; and State Route 16, which connects Wellesley and Sherborn. State Route 27 extends across town in a north-south direction. Direct access to the airport and port of Boston is provided by State Route 128 and Interstate Route 495 (Department of Housing and Community Development, 1997).

Conrail provides a freight rail line through the town of Natick. A commuter rail service is also available from Natick and West Natick to Boston. The commuter rail runs north-south into town, and east-west through the center of town. Natick is a member of the Massachusetts Bay Transportation Authority (MBTA), which provides public transportation to the Boson Metropolitan Area. The Gray Line of Boston, Inc. and Suburban Line provide bus service to Boston and Worcester. A bus station is located in Framingham. These bus lines are connected to the Natick Neighborhood Bus System, which consists of two buses that follow routes from the town common through Natick on an hourly schedule. The town of Natick and the MBTA's Suburban Transportation Program subsidize the Natick Neighborhood Bus System (Sanford Ecological Service, Inc., 1995).

Commercial airline service to the Natick area is available at the Logan International Airport, which is located less than 3 miles from downtown Boston, and the T.F. Green Airport located in Providence, Rhode Island.

4.19 Public Opinion

The SSCOM conducts an active public participation program for environmental affairs. The Restoration Advisory Board (RAB) is composed of Natick town officials; SSCOM, USEPA, and MDEP personnel; and community volunteers who address issues related to the SSCOM Installation. The RAB also produces on a regular basis an informational flyer entitled *Environmental Report*.

5.0 ENVIRONMENTAL CONSEQUENCES

5.1 Introduction

In this section, the potential environmental and human health consequences of the continued operation of USARIEM at its current location and in its present scope as described in Section 2.0 will be discussed. This section will identify and analyze potential cause and effect relationships that may exist between the proposed action and potential impacts, if any. Such an analysis entails detailing the potential impacts associated with the proposed action at USARIEM that may not necessarily occur but are reasonably predictable. This analysis determines whether continuing USARIEM research activities has the potential for significant environmental impacts. It also serves to assist decision makers and the public in making reasonable choices among the alternatives.

The term "consequence" refers to the results of an event or events without consideration of probability. Where possible and appropriate, potential events will be characterized both in terms of their potential consequence and the probability that they will occur. Consequences of the proposed action on the public, the workers, and the environment will be considered. Direct, indirect, and cumulative effects will also be considered.

5.2 Environmental Consequences of Routine Operations at USARIEM

5.2.1 Land Use

The continued operation of current and future planned research activities at USARIEM will not adversely impact land use in Natick, Massachusetts. There are no projected impacts to land use associated with implementation of the proposed action because current research activities are conducted in existing facilities, no construction or renovation is proposed, and land use is not currently being adversely affected or altered. Further, Building 42 is compatible with adjacent land uses on the SSCOM Installation.

5.2.2 Climate

It is not anticipated that the climate of Natick will be adversely impacted by implementing the proposed action (see Section 5.2.8).

5.2.3 Geology

It is unlikely that the continued operation of USARIEM will negatively impact geological resources at the SSCOM Installation, because construction or extensive renovations are not planned.

5.2.4 Soils

It is not anticipated that the continued operation of the research activities at USARIEM will result in significant adverse environmental impacts to soils at the SSCOM Installation. USARIEM is situated in conformance with local topography and, therefore, is unlikely to cause excessive erosion. Nonetheless, there is a potential for low impact to soils, topography, and erosion resulting from USARIEM's contribution to local landfills through the disposal of waste materials. USARIEM disposes of 1,500 cubic yards of solid waste. Ash generated by

USARIEM's pathological waste incinerator is also disposed of in a landfill. One 55-gallon drum of incinerator ash is turned in to an approved waste disposal contractor at approximately 2-year intervals (Durkot, 1997a). The overall contribution by USARIEM to local landfills is negligible in comparison to the total amount of waste entering these landfills.

The Installation was designated a Superfund Site on the NPL in 1994 (see Section 4.8). The two primary sites of soil contamination on the Installation, are near Building T-25 and a former proposed gymnasium site. Building T-25 is located on the north end of the Installation, and the former proposed gymnasium site is located south of the entrance to the Installation (see Figure 2-3) (SSCOM, 1997c). These sites are being investigated to determine appropriate remediation techniques and clean-up goals. The degree to which USARIEM research activities have contributed to the soil contamination on the Installation is unknown. Continued adherence to applicable SOPs and federal, state, and local regulations will ensure that USARIEM activities do not contaminate soil.

5.2.5 Water Resources

5.2.5.1 Surface Water

It is unlikely that significant adverse environmental impacts to surface-water quality will result from the conduct of routine research activities at USARIEM. The water supply for the facility, which is provided by the Town of Natick Public Water Department, is obtained from a combination of reservoirs and aquifers in the Natick area. Municipal water is processed at the Springvale Water Treatment Plant prior to distribution to the SSCOM Installation and the Town of Natick. USARIEM consumes approximately 4.0 million gallons of water per year. Implementation of the proposed action will not significantly affect water consumption at USARIEM because research activities are not anticipated to change significantly in scope.

Potential impacts to surface-water quality could result if wastewater from USARIEM research activities is discharged directly into a waterbody without adequate treatment, which is unlikely. The handling and disposal of wastewater originating from research laboratories are regulated by DoD, Army, federal, state, and local policies, guidelines, and regulations. Wastewater that is generated by USARIEM does not require any special pretreatment and, therefore, is discharged directly into the sanitary sewer system. The MWRA owns and maintains the sewer system and the associated wastewater treatment plants. SSCOM maintains a MWRA Sewer Use Discharge Permit (No. 22 001 808) for wastewater discharges from the Installation as a whole (see Section 4.7.1) (MWRA, 1997a). Wastewater from the Installation currently flows to the Nut Island Sewage Treatment Plant for treatment prior to discharge into the Boston Harbor. In the near future, wastewater from USARIEM will receive primary and secondary treatment at the Deer Island Sewage Treatment Plant and will be discharged into the Massachusetts Bay (Gawrys, 1997). All discharges from both the Nut Island and Deer Island plants must meet the requirements of MWRA's National Pollutant Discharge Elimination System (NPDES) permits. Therefore, no significant adverse environmental impacts to the Boston Harbor or the Massachusetts Bay are anticipated to result from the implementation of the proposed action. Further, no significant adverse environmental impacts to Lake Cochituate or the Sudbury River are expected because USARIEM does not discharge any wastewater directly into any lakes,

streams, or rivers. However, minor impacts to the lake may result from stormwater run-off from the Installation. SSCOM also has an NPDES permit to discharge lake water cooling water back into the lake. SSCOM no longer uses lake water because of new cooling towers; however, the NPDES permit remains in place for planning purposes.

Due to high concentrations of PCBs and mercury in fish tissue, a fish consumption advisory was issued for Lake Cochituate by MDPH in 1995. The degree to which USARIEM has contributed to the surface water contamination in Lake Cochituate is not known (SSCOM, 1997c). However, continued adherence to federal, state, and local environmental regulations will minimize the potential for further contamination of the site by USARIEM. Measurable mercury in sewer lines is thought to be residual mercury from past uses and not a result of current uses. In addition to efforts to eliminate mercury discharge, several programs are being implemented at SSCOM to modify and remove mercury existing in sewer lines from past uses (Lindsay, 1993; Manning et al., 1997; U.S. Army Materiel Command Installations and Services Activity, 1994).

5.2.5.2 Groundwater

Continued operation of USARIEM research activities in their present scope is not anticipated to significantly impact groundwater resources in the vicinity of Natick. Groundwater in combination with surface water is used as the municipal water supply for the Town of Natick (see Section 4.7.2). The amount of water consumed by USARIEM is not anticipated to change significantly from 4.0 million gallons per year as a result of the implementation of the proposed action. Wastewater from USARIEM is not discharged to pathways that would come into contact with groundwater. Therefore, the impact to groundwater resources is expected to be minimal.

The degree to which research activities at USARIEM have contributed to groundwater contamination at the Installation is not known. Continued compliance with applicable federal, state, and local regulations designed to protect groundwater resources will mitigate or eliminate negative impacts to groundwater resulting from the implementation of the proposed action.

5.2.6 Plant and Animal Ecology

It is unlikely that the continued operation of USARIEM will impact the plant and animal ecology of Natick. USARIEM is an existing facility and no construction or renovation activities are planned. Further, proper disposal of the waste generated by research activities at USARIEM will ensure that potential adverse impacts to wildlife are minimized. Wildlife and/or endangered species are not used in USARIEM research projects.

The potential for the aquatic life of the Boston Harbor or Massachusetts Bay to be adversely impacted by the implementation of the proposed action is negligible. Wastewater resulting from USARIEM research activities is currently transported via the MWRA sewer system for processing at the Nut Island Sewage Treatment Plant prior to discharge into the Boston Harbor. Within the next year, USARIEM effluent will receive primary and secondary treatment at the Deer Island Sewage Treatment Plant prior to discharge into Massachusetts Bay (Gawrys, 1997). All discharges from both treatment plants must be in compliance with applicable federal and state regulations. Appropriate water quality standards for the protection of aquatic life will not be exceeded by treated sewage that is discharged from either treatment plant.

5.2.7 Wetlands

The wetland habitats located on the SSCOM Installation are unlikely to be adversely impacted by the continued operation of USARIEM. Currently, there are no observable impacts on the wetland habitats resulting from the conduct of routine operations at USARIEM. In addition, all wastewater discharges from USARIEM are transported to the Nut Island Sewage Treatment Plant, where they are treated prior to discharge into the Boston Harbor. USARIEM does not discharge any wastewater directly into any wetlands.

5.2.8 Air Quality

Continued operation of USARIEM in its present scope is not anticipated to significantly impact the ambient air quality or climate in the Natick region. All animal carcasses and approximately half of the burnable infectious waste generated by USARIEM are incinerated on-site in the pathological waste incinerator. USARIEM is permitted by the State of Massachusetts to operate the incinerator to burn one batch per day. According to the permit, the incinerator's maximum charging rate is 100 pounds per batch (MacDonald, 1990). The USARIEM incinerator is not used on a regular basis because USARIEM generates very small quantities of infectious waste. Although the facility is permitted to burn 100 pounds, USARIEM burns a maximum of 30 pounds to reduce the potential for smoke exiting the stack (USARIEM, undated[b]). In 1998, the MDEP will conduct a stack test on the incinerator using a full load. Based upon stack test results, USARIEM may choose to transport their burnable biohazardous waste to an off-site location for incineration.

There are only two primary sources of air pollutant emissions on the Installation: the boiler plant and the USARIEM incinerator (see Table 4-2). In contrast to the boiler plant, emissions from the incinerator are very small; therefore, continued operation of the research activities conducted at USARIEM will continue to have a minor impact on local air quality. Incineration of USARIEM infectious waste must be conducted in accordance with applicable federal, state, and local regulations to minimize air emissions and the subsequent potential adverse impacts to local air quality and climate.

Other sources of air emissions on the Installation are laboratory hoods and vehicular traffic. Emissions from laboratory hoods during routine activities are negligible. Further, vehicle emissions from the commuting activities of the workforce at USARIEM will not change from current levels because no additional employees are currently planned for the continued operation of USARIEM in its present scope. Neither laboratory hoods nor vehicular traffic on the Installation are anticipated to adversely impact local air quality as a result of implementation of the proposed action.

5.2.9 Historical and Cultural Resources

No impacts to significant historical or cultural resources in Natick are expected to result from implementing the proposed action (Hammer, 1997). No significant historical or archaeological resources are located adjacent to Building 42 on the SSCOM Installation.

5.2.10 Energy Resources

No significant impacts to energy resources are anticipated from the continued operation of USARIEM. Routine operations at USARIEM require the use of electricity, natural gas, and steam. In addition, minimal amounts of energy are consumed daily by the commuting workforce. Energy usage by USARIEM is anticipated to remain relatively the same as current levels, because the scope of the work conducted at the facility is not expected to change significantly.

5.2.11 Socioeconomic Environment

The socioeconomic impacts resulting from implementation of the proposed action will likely be minor but positive to the local economy. Although continued operation of USARIEM will not create any new jobs in the Natick region, the proposed action will maintain current employment levels and support existing government operations. The USARIEM currently employs 71 full-time and 10 part-time individuals (Durkot, 1997a). In addition, the aesthetics of the area surrounding the USARIEM facility are not anticipated to be adversely impacted by continued operation of USARIEM.

5.2.12 Environmental Justice

Continued operation of the research activities at USARIEM is not expected to result in significant adverse impacts to minority or low-income populations in Natick. According to 1990 census data, 3.1% of Natick residents were living below the poverty level. Therefore, Natick is not considered a "poverty area" as defined by the Census Bureau. The 1990 census also indicates that 93.7% of the population in the town of Natick is Caucasian. Because USARIEM research activities are not expected to result in significant adverse impacts to air quality, noise levels, visual resources, transportation systems, odors, utilities, energy supplies, historical and cultural resources, or waste generation, implementation of the proposed action is not anticipated to have any disproportionately high adverse human health or other environmental impacts on low-income or minority populations in Natick.

5.2.13 Noise

It is not anticipated that continued operation of USARIEM research activities will generate a significant amount of noise on the Installation. The MDEP Division of Air Quality Control does not have any records of complaint regarding noise originating from USARIEM (Hancock, 1997).

5.2.14 Odors

Implementation of the proposed action is not anticipated to generate significant odors on the Installation. Continued operation of the USARIEM incinerator at reduced levels will increase the efficiency of the incinerator, prevent the generation of black smoke, and minimize the generation of odors resulting from incineration of infectious and pathological waste. However, if odors do arise from the incineration of wastes, these odors are transitory and rapidly diluted in the atmosphere. No records of complaints regarding odors originating from USARIEM are on file with the MDEP Division of Air Quality Control (Hancock, 1997).

5.2.15 Transportation

The impacts to transportation resources in the Natick region associated with the conduct of routine operations at USARIEM are negligible. Vehicular traffic from USARIEM commuters is extremely small when compared with traffic in the Boston area. Traffic patterns in the vicinity of the SSCOM Installation are not anticipated to be adversely impacted by implementation of the proposed action because USARIEM activities are conducted in an existing facility and no additional employees are required.

5.2.16 Public Opinion

The SSCOM communicates regularly with the public regarding activities on the Installation and conducts an active public participation program in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). However, these issues are not directly related to the research activities conducted at USARIEM. Potential criticisms of the proposed action may include the use of human volunteers and research animals. A strict quality assurance process is implemented for each USARIEM research protocol that involves the use of human volunteers or research animals. This process is followed to ensure the protection of human volunteers and the proper care and handling of animals for research purposes.

5.2.17 Human Health and Safety

5.2.17.1 Worker Health and Safety

Routine operations at USARIEM pose a negligible risk to the health and safety of the workforce. Risks posed to the workforce at USARIEM will be managed and minimized through the use of safety equipment, procedures, and training. Worker safety is an essential and integral part of all research conducted at USARIEM, including work involving radionuclides and hazardous chemicals. All USARIEM research activities are conducted in BL-1 laboratories, which require relatively few safety precautions because work is conducted with "known" infectious agents posing minimal risk to healthy workers. Work conducted in BL-1 laboratories presents minimal risks to the laboratory worker and the environment.

USARIEM has developed a formal SOP for all hazardous operations conducted at USARIEM (see Section 2.5). Adherence to SOPs ensures compliance with all applicable federal, state, and local regulations governing all aspects of worker safety. This includes safety provisions of USEPA, DA, SSCOM, USAMRMC, and USARIEM regulations, CDC/NIH Guidelines, and OSHA requirements. Through the use of this SOP and the enforcement measures in place, the potential adverse impacts to worker health and safety at USARIEM are minimized. USARIEM has a spotless safety record with no violations or fines. USARIEM maintains a very effective safety program to protect its workforce from harm. All USARIEM employees are trained and certified to perform their duties in a safe and efficient manner (Durkot, 1997a). Therefore, continued conduct of research activities at USARIEM in accordance with SOPs, guidelines, and controls is very unlikely to have significant adverse impacts on worker health and safety.

5.2.17.2 Human Volunteer Health and Safety

Risks posed to the health and safety of human volunteers used in USARIEM research projects are negligible. All research protocols involving the use of human subjects must be approved by the HURC prior to initiation. It is the responsibility of the HURC to ensure that research activities conducted by USARIEM adhere to established standards for the health, welfare, and

use of human subjects (USARIEM, 1996). The Quality Assurance Committee monitors medical risk aspects of research involving human subjects at USARIEM (USARIEM, 1996). A Medical Monitor is a physician assigned by the Commander, USARIEM for the medical care of human subjects used in research at USARIEM. The Medical Monitor will ensure the safety and well-being of subjects during a study and will provide emergency treatment for medical conditions that develop during or subsequent to a study (USARIEM, 1998). The Quality Assurance Committee also oversees the research subject health surveillance database to identify medical findings and trends associated with participation in research projects under a variety of environmental conditions (USARIEM, 1996). Stringent policies and procedures are in place at USARIEM to protect the health and welfare of human subjects. Therefore, continued operation of the research activities at USARIEM is not anticipated to have a significant adverse impact on the health and safety of human volunteers.

5.2.17.3 Public Health and Safety

Risks to the health of the general public from routine operations at USARIEM are negligible. All research activities conducted at USARIEM are performed in accordance with SOPs, guidelines, and regulations in order to minimize the potential for the release of any chemicals, radionuclides, or toxins into the environment. Further, all research performed at USARIEM is conducted in BL-1 laboratories, which are suitable for work involving well-characterized agents not known to cause disease in healthy adult humans. USARIEM maintains an efficient and well-run safety program, which has resulted in a spotless safety record with no violations or fines (Durkot, 1997a). USARIEM does not generate significant quantities of radiological, hazardous, or infectious waste that require disposal. In addition, proper waste disposal procedures in place at USARIEM will prevent the accidental release of hazardous substances into the local environment.

5.2.17.4 Accidents and Incidents

Adverse environmental impacts might result if a hazardous substance were accidentally released into the air or water. Hazardous substances released into the MWRA sanitary sewer system in the near future would be routed to the Nut Island Sewage Treatment Plant where wastewater is treated prior to discharge into the Boston Harbor. Following conversion of the sewer system, accidental releases from USARIEM would be conveyed to the Deer Island Sewage Treatment Plant prior to discharge into Massachusetts Bay (Gawrys, 1997). In the event of an accidental release, USARIEM must immediately notify the ESHO, who must in turn notify MWRA personnel to mitigate any potential adverse impacts to the Boston Harbor or Massachusetts Bay. A hazardous substance might accidentally be released into the air as a result of malfunctioning of the incinerator or laboratory fume hoods. Inspection of the incinerator on an annual basis is designed to identify any potential problems with the incinerator before they occur. Adherence to applicable SOPs that confirm their correct operation prevents the accidental release of hazardous substances through laboratory fume hoods. No major accidents or incidents have occurred at USARIEM in the last 5 years (Durkot, 1997a).

In the event of a hazardous material spill at USARIEM, the SSCOM HAZMAT team must be notified. The HAZMAT team, composed of both chemical and petroleum units, will be responsible for clean-up of the spill. In the event of a fire at USARIEM, Natick Security will be contacted immediately with the type (e.g., paper, chemical, electrical) and location of the fire.

Any individual who identifies a fire at the facility will also sound the fire alarm and take action to contain the fire, which includes utilizing the appropriate fire extinguisher, closing all doors and windows on the same floor, and ensuring that the main door to Building 42 is not locked.

5.3 Cumulative Impacts

No negative cumulative impacts to human health or the environment have been attributed to routine operations at USARIEM. It is unlikely that cumulative adverse environmental impacts will result from continued operations at USARIEM. Minor adverse impacts may result from operation of the pathological waste incinerator. USARIEM wastes will contribute to adverse impacts resulting from the SSCOM waste stream. Routine operations at USARIEM have negligible impacts on the health and safety of the public and the USARIEM workforce. USARIEM is located in existing facilities and no significant impacts from ongoing operations have been identified. Thus, no cumulative impacts to the surrounding environment are expected. Continued operation of USARIEM is likely to result in a minor positive impact to the local economy.

5.4 Comparison of the Proposed Action with the Alternatives

5.4.1 Alternative I – Continued Operation of USARIEM in Its Present Scope

Alternative I includes the continued conduct of current and planned future research activities at USARIEM in their present scope and in existing facilities. This alternative is considered the preferred alternative because it fully utilizes state-of-the-art equipment and technology and experienced personnel already engaged in the conduct of activities at USARIEM. Continued operation of USARIEM in its present scope involves the continuation of tangible but minor adverse impacts such as contributions to the waste stream and to local air quality. Negligible impacts to worker health and safety are associated with the continued operation of USARIEM; however, the potential for adverse impacts to the workforce is mitigated through the use of strict safety requirements. This alternative is the preferred alternative because it also includes continued support of USAMRMC Army Operational Medicine Research Program and contributions to the scientific community, and it best meets the needs of national defense.

5.4.2 Alternative II – Relocation of USARIEM Research Activities

Alternative II entails relocating the current and planned future research activities performed at USARIEM to a new location. The potential environmental and human health impacts associated with USARIEM research activities are primarily site-independent. With appropriate controls in place (e.g., operational, safety) the activity can be conducted at almost any location without significant adverse impacts to the environment. Appropriate controls are currently in place at USARIEM, and are utilized by experienced personnel. Construction of a new facility or renovation of an existing facility to support the mission of USARIEM has the potential for negative impacts to the environment as a result of construction efforts. In addition, construction or renovation activities would delay execution of USARIEM's mission. It would be very expensive to reconstruct the state-of-the-art equipment and facilities located at USARIEM. To conduct USARIEM research activities at another location, similar controls and compliance with

applicable regulations would be required. This alternative is not the preferred alternative, because moving USARIEM research activities to another location would have similar impacts to human health and the environment after completion of construction or renovation activities. Further, this alternative is not considered the preferred alternative because it is not envisioned to have any benefit over the preferred alternative.

5.4.3 Alternative III – Cessation of USARIEM Research Activities (No Action Alternative)

Because USARIEM is a functioning organization, the no action alternative is to cease the activities presently assigned by USAMRMC to USARIEM. This alternative would cause the discontinuation of a significant portion of the Army Operational Medicine Research Program. While implementation of this alternative would eliminate the negligible-to-minor impacts associated with the preferred alternative, identified national defense needs would not be met.

6.0 CONCLUSIONS

The principal conclusions of this EA are: (1) risks to the environment and human health and safety associated with the continued operation of USARIEM in its present scope and location (Alternative I) are extremely small; (2) the research activities conducted at USARIEM will result in important benefits to the United States by protecting soldiers and sustaining their fighting ability on the battlefield; and (3) implementation of the proposed action (Alternative I) will not result in significant adverse environmental or human health impacts. Relocating these research activities to another location (Alternative II) will not significantly alter the environmental impacts associated with this project and will cause a significant delay in meeting the needs of national defense. Transferring USARIEM research activities to another location would not utilize the state-of-the-art facilities and technologies already in place at USARIEM. Cessation of USARIEM research activities (Alternative III) will eliminate the potential environmental and human health impacts associated with the proposed action but would impair the national defense posture by reducing the protection provided to U.S. military personnel on the battlefield.

The continued operation of USARIEM research activities at the SSCOM Installation is likely to be conducted without significant adverse environmental impact. The most severe potential effects associated with the proposed action are anticipated to be minor, and to date, all observed effects at this site resulting from the proposed action have been insignificant. Potential risks to the USARIEM workforce, the local community, and the environment will continue to be mitigated by the application of required work practice and engineering controls that direct the safe handling, use, and disposal of hazardous materials. Further, implementation of the proposed action (Alternative I) will result in significant benefits to the national defense posture.

7.0 REFERENCES

Army Acquisition Pollution Prevention Support Office. 1994. *Materiel Developer's Guide for Pollution Prevention*. U.S. Army Medical Command.

Arnold, A. 1997. Written personal communication from A. Arnold (Natural Heritage & Endangered Species Program, Division of Fisheries and Wildlife, Commonwealth of Massachusetts) to N.A. Ferrari (BSA Environmental Services, Inc.) dated 3 December 1997.

ATSDR. 1997. *Draft Health Consultation, Natick Laboratory Army Research a/k/a U.S. Army Soldier Systems Command (SSCOM) – Natick CERCLIS No. MA1210020631*. U.S. Department of Health and Human Services, Public Health Service. October 1997.

Centers for Disease Control and Prevention/National Institutes of Health. 1993. *Biosafety in Microbiological and Biomedical Laboratories,* 3rd Edition. HHS Publication No. (CDC) 93-8395. U.S. Government Printing Office, Washington, DC.

City of Boston. 1997. City of Boston Web Site.

Department of Housing and Community Development. 1997. *Community Profile for Natick, Middlesex County, Massachusetts.*

Durkot, M.J. 1997a. Personal communication between Dr. M.J. Durkot (USARIEM), Dr. R.J. Carton (USAMRMC), Dr. J.R. Beaver (BSA Environmental Services, Inc.), and R.L. Phillips (BSA Environmental Services, Inc.) on November 6, 1997.

Durkot, M.J. 1997b. Personal communication between Dr. M.J. Durkot (USARIEM) and R.L. Phillips (BSA Environmental Services, Inc.) on November 24, 1997.

Environmental, Safety, and Health Directorate. 1997. *1996 Installation Source Registration/Emission Statement.* Submitted to Massachusetts Department of Environmental Protection, Division of Air Quality Control.

Gawrys, T. 1997. Personal communication between T. Gawrys (MWRA) and R.L. Phillips (BSA Environmental Services, Inc.) on December 1, 1997.

Gentile, B.J. 1996. Memorandum for All U.S. Army Research Institute of Environmental Medicine Personnel, Subject: Infectious Waste Disposal. 21 February 1996.

Hammer, G.D. 1997. Written communication from G.D. Hammer (Massachusetts Historical Commission) to N.A. Ferrari (BSA Environmental Services, Inc.) dated October 30, 1997.

Hancock, M. 1997. Personal communication between M. Hancock (Division of Air Quality Control, MDEP) and N.A. Ferrari (BSA Environmental Services, Inc.) on October 23, 1997.

Lindsay, G.C. 1993. Memorandum for Commander, from G.C. Lindsay, III (Deputy Commander). Subject: Mercury Release from this Installation. 29 January 1993.

MacDonald, E.H. 1990. Written communication from E.H. MacDonald (Department of Environmental Quality Engineering) to the U.S. Army Natick Research & Development Center, Natick, Massachusetts, dated April 23, 1990.

Manning, J.J., G.T. Garrahan, and J. McCassie. 1997. Personal communication between J.J. Manning (ESHO, SSCOM), G.T. Garrahan (ESHO, SSCOM), J. McCassie (ESHO, SSCOM), Dr. M.J. Durkot (USARIEM), Dr. R.J. Carton (USAMRMC), Dr. J.R. Beaver (BSA Environmental Services, Inc.), and R.L. Phillips (BSA Environmental Services, Inc.) on November 6, 1997.

Massachusetts Department of Environmental Protection. 1996. *1996 Annual Air Quality Report for the State of Massachusetts*.

Massachusetts Department of Revenue. 1997. *At a Glance Report for Natick.*

Massachusetts Water Resources Authority. 1997a. Sewer Use Discharge Permit Number 22 001 808.

Massachusetts Water Resources Authority. 1997b. *How Sewers Work*.

Massachusetts Water Resources Authority. 1997c. *Facts about Your Deer Island Tour*. A Massachusetts Water Resources Authority Publication. Summer 1997.

Middlesex Conservation District. 1995. *Middlesex County, Massachusetts Interim Soil Survey Report*.

Miller Microcomputer Services. 1997a. *The Lake Cochituate Watershed in Massachusetts, U.S.A.*

Miller Microcomputer Services. 1997b. *Cancer Incidence in Natick, Massachusetts.*

National Climatic Data Center. 1990. *Boston, Massachusetts Historical Weather Data*.

National Oceanic and Atmospheric Administration. 1997. Office of Ocean Resources Conservation and Assessment. *Site Exposure Potential*.

Perodeau, J. 1997. Personal communication between J. Perodeau (Town of Natick Public Water Department) and N.A. Ferrari (BSA Environmental Services, Inc.) on October 27, 1997.

Reed Travel Group. 1997. *Boston, Massachusetts – Fact Sheet*.

Sanford Ecological Services, Inc. 1995. *Open Space and Recreation Plan Natick, Massachusetts, 1995*.

State of Massachusetts. 1997. State of Massachusetts Web Site.

Tobias, S.W. 1997. Personal communication between Dr. S.W. Tobias (USARIEM), Dr. M.J. Durkot (USARIEM), Dr. R.J. Carton (USAMRMC), Dr. J.R. Beaver (BSA Environmental Services, Inc.), and R.L. Phillips (BSA Environmental Services, Inc.) on November 6, 1997.

U.S. Army Materiel Command Installations and Services Activity. 1994. *Environmental Compliance Assessment System Final Report: U.S. Army Natick Research, Development, and Engineering Center.* June 1994.

U.S. Army Medical Research and Materiel Command. 1996. The U.S. Army Medical Research and Materiel Command Web Site.

U.S. Army Research Institute of Environmental Medicine. 1994. U.S. Army Research Institute of Environmental Medicine Memorandum Number 385-3. *Biological Tissue Handling and Selection and Use of Sterilants/Disinfectants*. 1 December 1994.

U.S. Army Research Institute of Environmental Medicine. 1996a. U.S. Army Research Institute of Environmental Medicine Standard Operating Procedure Number 1. *Field Organizations Staff Duty Officer/Staff Duty NCO*. 9 December 1996.

U.S. Army Research Institute of Environmental Medicine. 1996b. U.S. Army Research Institute of Environmental Medicine Memorandum Number 70-68. *Quality Assurance Program*. 1 December 1996.

U.S. Army Research Institute of Environmental Medicine. 1996c. U.S. Army Research Institute of Environmental Medicine Memorandum Number 70-16. *Animal Research*. 1 February 1996.

U.S. Army Research Institute of Environmental Medicine. 1996d. U.S. Army Research Institute of Environmental Medicine Memorandum Number 70-18. *Laboratory Animal Care and Use Committee*. 1 February 1996.

U.S. Army Research Institute of Environmental Medicine. 1997a. U.S. Army Research Institute of Environmental Medicine brochure.

U.S. Army Research Institute of Environmental Medicine. 1997b. The U.S. Army Research Institute of Environmental Medicine Web Site.

U.S. Army Research Institute of Environmental Medicine. 1997c. U.S. Army Research Institute of Environmental Medicine Memorandum Number 385-5. *Biological Infectious Waste Disposal*. 10 February 1997.

U.S. Army Research Institute of Environmental Medicine. 1997d. U.S. Army Research Institute of Environmental Medicine Memorandum Number 385-12. *Exposure Control Plan for Bloodborne Pathogens*. 10 February 1997.

U.S. Army Research Institute of Environmental Medicine. 1998. U.S. Army Research Institute of Environmental Medicine Memorandum Number 70-25. *Human Research*. 1 January 1998.

U.S. Army Research Institute of Environmental Medicine. Undated[a]. *Incinerator Notes*.

U.S. Army Research Institute of Environmental Medicine. Undated[b]. *Standing Operating Procedure USARIEM Incinerator*.

U.S. Army Soldier Systems Command. 1996a. U.S. Army Soldier Systems Command Memorandum Number 385-69. *Biological Safety Program*. 1 March 1996.

U.S. Army Soldier Systems Command. 1996b. U.S. Army Soldier Systems Command Memorandum Number 385-2. *Hazard Communication Program*. 31 March 1996.

U.S. Army Soldier Systems Command. 1996c. U.S. Army Soldier Systems Command Memorandum Number 385-7. *Accident Reporting*. 31 January 1996.

U.S. Army Soldier Systems Command. 1997a. U.S. Army Soldier Systems Command Memorandum Number 385-17. *Preparation of Standing Operating Procedures for Safety and Hazardous Materials.* 30 November 1997.

U.S. Army Soldier Systems Command. 1997b. *Chemical Hygiene Plan*. 1 March 1997.

U.S. Army Soldier Systems Command. 1997c. *Environmental Report*. Summer 1997.

U.S. Environmental Protection Agency. 1997. *U.S. Environmental Protection Agency National Priorities List: Natick Laboratory Army Research, Development, and Engineering Center*. U.S. Environmental Protection Agency, Office of Emergency and Remedial Response. Web publish date March 26, 1997.

U.S. Fish and Wildlife Service. 1978. *National Wetlands Inventory Map - Natick, Massachusetts Quadrangle.*

U.S. Nuclear Regulatory Commission. 1996. U.S. Nuclear Regulatory Commission Materials License Number 20-00315-02.

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10.0 ACRONYMS & ABBREVIATIONS

AAALAC	Association for Assessment and Accreditation of Laboratory Animal Care
AAPPSO	Army Acquisition Pollution Prevention Support Office
AFB	Air Force Base
AR	Army Regulation
ATSDR	Agency for Toxic Substances and Disease Registry
AWQC	Ambient Water Quality Criteria
BHC	Benzene Hexachloride
BL	Biosafety Level
^{14}C	Carbon-14
CAA	Clean Air Act
CDC	Centers for Disease Control and Prevention
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CHM	Chemical Hygiene Manager
CHP	Chemical Hygiene Plan
CO	Carbon Monoxide
^{51}Cr	Chromium-51
DA	Department of the Army
DCE	1,2-dichloroethylene
DoD	Department of Defense
EA	Environmental Assessment
ECAS	Environmental Compliance Assessment System
ESHO	Environmental, Safety and Health Office
^{3}H	Tritium
HAZCOM	Hazard Communication
HAZMAT	Hazardous Material
Health Clinic	U.S. Army Occupational Health Clinic
HIV	Human Immunodeficiency Virus
HURC	Human Use Review Committee

^{125}I	Iodine-125
IACUC	Institutional Animal Care and Use Committee
MBTA	Massachusetts Bay Transportation Authority
MCLs	Maximum Contaminant Levels
MDEP	Massachusetts Department of Environmental Protection
MDPH	Massachusetts Department of Public Health
MEDCOM	U.S. Army Medical Command
mg/L	Milligrams per liter
mmbtu	Million British Thermal Units
MOU	Memorandum of Understanding
mph	Miles per hour
MSDS	Material Safety Data Sheet
msl	Mean sea level
MWRA	Massachusetts Water Resources Authority
NAAQS	National Ambient Air Quality Standards
NCO	Noncommissioned Officer
NEPA	National Environmental Policy Act
NIH	National Institutes of Health
NOAA	National Oceanic and Atmospheric Administration
NOx	Nitrogen Oxides
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NRC	U.S. Nuclear Regulatory Commission
NRDEC	U.S. Army Natick Research, Development, and Engineering Center
O_3	Ozone
OSHA	Occupational Safety and Health Act
^{32}P	Phosphorus-32
PCBs	Polychlorinated biphenyls
PCE	Perchloroethylene
PM_{10}	Particulate matter less than 10 microns in aerodynamic diameter
PPC&E	Personal Protective Clothing and Equipment
ppm	Parts per million

QAP	Quality Assurance Program
RAB	Restoration Advisory Board
RCRA	Resource Conservation and Recovery Act
REC	Record of Environmental Consideration
SAA	Satellite Accumulation Area
SAIC	Science Applications International Corporation
SD	Staff Duty
SO_2	Sulfur Dioxide
SOP	Standing Operating Procedure
SRC	Scientific Review Committee
SSCOM	U.S. Army Soldier Systems Command
SSCOM-M	U.S. Army Soldier Systems Command Memorandum
SuAsCo	Sudbury, Assabet, and Concord Rivers
SVOCs	Semi-Volatile Organic Compounds
TCE	Trichloroethylene
TSP	Total suspended particulate
USAARL	U.S. Army Aeromedical Research Laboratory
USAMRDC	U.S. Army Medical Research and Development Command
USAMRMC	U.S. Army Medical Research and Materiel Command
USARIEM	U.S. Army Research Institute of Environmental Medicine
USARIEM-M	U.S. Army Research Institute of Environmental Medicine Memorandum
USC	U.S. Code
USEPA	U.S. Environmental Protection Agency
VOC	Volatile Organic Compound
WRAIR	Walter Reed Army Institute of Research

APPENDIX A

Common Upland Plant Species Observed in the Town of Natick

(as cited in Sanford Ecological Services, Inc., 1995)

Tree Layer	Red Oak
	White Oak
	White Pine
	Gray Birch
	Black Cherry
Shrub Layer	Honeysuckle
	Witch Hazel
	European Buckthorn
	Multiflora Rose
	Bramble
Herbaceous Layer	Upland Grasses
	Goldenrod
	Club Moss
	Common Dewberry

APPENDIX B

Wildlife Species in the Town of Natick

(as cited in Sanford Ecological Services, Inc., 1995)

Birds

10.1 Migratory/Songbirds

Bunting
Sparrow
Towhee
Cardinal
Goldfinch
Oriole
Vireo
Warbler (some rare)

10.2 Birds of Prey

Hawk
Owl

Waterfowl

Goose
Duck
Teal

10.3 Marsh Birds/Waders

Rail
Woodcock
Bittern (rare)
Heron (rare)

Upland Game Birds

Grouse
Quail
Pheasant

Reptiles/Amphibians

Frog
Salamander (some rare)
Snake
Toad
Turtle

Small Game Mammals

Beaver
Chipmunk
Fox
Muskrat
Otter
Rabbit
Raccoon
Skunk
Squirrel
Weasel

Large Game Mammals

White-tailed deer

APPENDIX C

Common Wetland Plant Species Observed in the Town of Natick

(as cited in Sanford Ecological Services, Inc., 1995)

Tree Layer	Red Maple
	Ash
Shrub Layer	Alder
	Sweet Pepperbush
	Highbush Blueberry
	Swamp Dogwood
	Arrow-wood
	Swamp Azalea
	With-rod
Herbaceous Layer	Sedges
	Common Cattail
	Cinnamon Fern
	Skunk Cabbage
	Hydrophilic Grasses